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NATIONAL DAM SAFETY PROGRAM. WILLIAM H. LUEHMANN RECREATION PON--ETC(U)
SEP 81 G KOCH DACW51-79-C-0001

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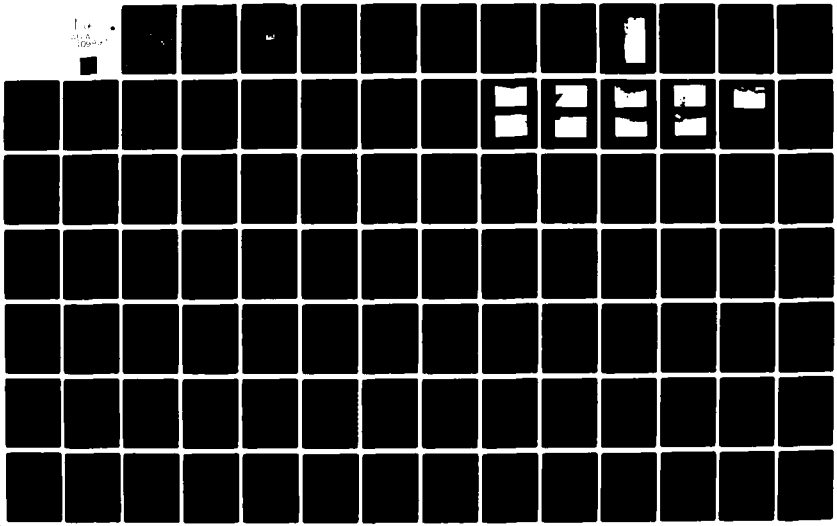

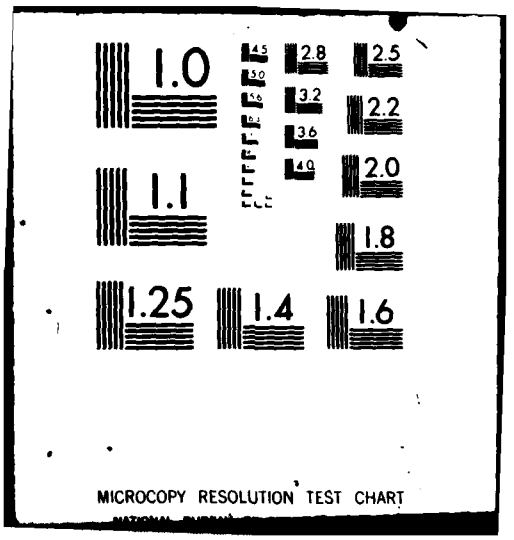
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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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READ INSTRUCTIONS BEFORE COMPLETING FORM

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3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
Phase I Inspection Report
Wm. H. Luchmann R EC Pond Dam
Delaware River Basin, Delaware County, NY
Inventory No. NY01199

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National Dam Safety Program

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Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability

William H. Luchmann R EC Pond Dam
Delaware County, NY
Delaware River Basin

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

The examination of documents and the visual inspection of William H. Luehmann Dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial action.

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cont

Using the Corps of Engineers' "screening criteria" for the initial review of spillway adequacy, it has been determined that the embankment would be overtopped for all storms in excess of 28% of the Probable Maximum Flood (PMF). The spillway is therefore adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

The classification of unsafe, applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an 'unsafe' classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to loss of life downstream of the dam.

DELAWARE RIVER BASIN

WILLIAM H. LUEHMANN RECREATION POND DAM

DELAWARE COUNTY, NEW YORK

INVENTORY NO. N.Y. 1199

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NEW YORK DISTRICT CORPS OF ENGINEERS

AUGUST, 1981

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
WILLIAM H. LUEHMANN RECREATION POND DAM
I.D. NO. 1199 DEC 119B 1337
DELAWARE COUNTY, N.Y.

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APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	William H. Luehmann Recreation Pond Dam
State Located:	New York
County:	Delaware County
Watershed:	Delaware River Basin
Stream:	Sherruck Brook tributary of Cannonsville Reservoir
Date of Inspection:	April 30, 1981

ASSESSMENT

The examination of documents and the visual inspection of William H. Luehmann Dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial action.

Using the Corps of Engineers' "screening criteria" for the initial review of spillway adequacy, it has been determined that the embankment would be overtopped for all storms in excess of 28% of the Probable Maximum Flood (PMF). The spillway is therefore adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

The classification of unsafe, applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an 'unsafe' classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to loss of life downstream of the dam.

It is therefore recommended that within 6 months of notification to the owner, a detailed hydrological/hydraulic investigation of the structure be undertaken to more accurately determine the site specific characteristics of the watershed.

The results of this investigation will determine the appropriate remedial measures which will be required. In the interim, a detailed emergency action plan must be developed and implemented during unusually heavy precipitation. Also, around-the-clock surveillance of the structure must be provided during these periods.

In addition, the dam has a number of problem areas which, if left uncorrected, have the potential for the development of hazardous conditions and must be corrected within one year. These areas are:

a. The slopes at the downstream toe appear very steep and lack vegetative cover. The areas include the drain channel and left side of the spillway channel. Backfill slope to existing wall at drain and seed the slope.

b. Remove trees and brush growing on the embankment between the drain and spillway.

c. Repair deteriorated concrete on the spillway walls and stepped channel.

d. Provide a program of periodic inspection and maintenance of the dam. Document this information for future reference.

e. Develop the aforementioned emergency action plan.

George Koch
Chief, Dam Safety Section
New York State Department
of Environmental Conservation
NY License No. 45937

Approved by:

Col. W. M. Smith, Jr.
New York District Engineer

Date: 14 Sep 81

OVERVIEW - WILLIAM LUEHMANN RECREATION POND DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
WILLIAM H. LUEHMANN RECREATION POND DAM
I.D. NO. 1199 DEC 119B 1337
DELAWARE COUNTY, N.Y.

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority
The Phase I inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367.

b. Purpose of Inspection
This inspection was conducted to evaluate the existing conditions of the dam, to identify deficiencies and hazardous conditions, to determine if these deficiencies constitute hazards to life and property, and to recommend remedial measures where required.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances
The William H. Luehmann Recreation Pond Dam is an earth fill structure about 300 feet long and 18 feet high. The alignment of the embankment is circular with the spillway approach channel and spillway located at the right abutment. The spillway consists of a 24 feet wide, concrete control section, which leads to a concrete stepped channel to the original stream bed. The channel walls consist of laid up stone with a 3 to 4 four inch thick reinforced concrete capping. The reservoir drain is an 18 inch steel pipe through the center of the embankment.

b. Location
The dam is located on Sherruck Brook which is a tributary to the Cannonsville Reservoir, Delaware River Basin. It is adjacent to the Mormon Hollow Road approximately 2.3 miles southwest of Trout Creek, NY.

c. Size
The dam is 18 feet high and impounds 362 acre feet at normal water surface elevation. The dam is classified as "small" in size.

d. Hazard Classification
The dam is classified as high hazard due to its location above several homes along the downstream channel. The homes are located in the town of Tompkins, Delaware County.

e. Ownership
The dam is owned by Ms. Pamela Dawber, 9911 W. Pico Blvd. P.H.A. Los Angeles, California. A local address for Ms. Dawber is East River Road, Walton, New York (607) 875-7373.

f. Purpose of Dam

The dam is used for recreational purposes.

g. Design and Construction History

The original dam on the site was used to power a mill. In 1956, the dam was raised and the spillway consisted of a 30 inch conduit, with a 4 feet concrete box inlet at the upstream toe of the present dam. In 1970, the present spillway was constructed, however, no water flowed over it until 1975. In 1980, the 30 inch conduit was replaced by an 18 inch steel pipe now used as a reservoir drain. The concrete box intake remains blocked with a steel plate. The plate can be removed with a cable which is tied to the embankment near the spillway.

h. Normal Operating Procedures

All flows are discharged over the spillway. The reservoir drain can be opened by use of the cable which is connected to the steel plate covering the opening.

1.3 PERTINENT DATA

a. Drainage Area (sq.mi.)	3.05
b. Elevations (ft. USGS Datum)	
Top of Dam	1500
Spillway Crest	1494
Original Stream Invert	1482
c. Reservoir (Acres; acre feet)	
Surface Area @ Top of Dam (acres)	45.0
Surface Area @ Spillway Crest (acres)	33.0
Storage @ Top of Dam (acre feet)	362.0
Storage @ Spillway Crest (acre feet)	130.0
d. Dam	
Type: Earth fill with clay core.	
Length (ft)	300.
Height (ft)	18.
Upstream slope	1:2.0
Downstream Slope	1:2.5
Crest Width	10
e. Spillway	
Type: Concrete channel forming a broad crested weir with a stepped energy dissipating outlet channel. Walls are of laid up stone with concrete cap.	
Weir Length (ft)	24.
Maximum Spillway Capacity (cfs)	1058.
f. Reservoir Drain:	
Type: 18 inch steel pipe through the embankment, concrete intake closed by a steel plate which can be removed with a cable.	

SECTION 2: ENGINEERING DATA

2.1 GEOLOGY

The William H. Luehmann Recreation Pond is located in the "Appalachian Uplands" physiographic province of New York State. This province (northern extreme of the Appalachian Plateau) was formed by the dissection of the uplifted, but flat lying sandstones and shales of the Middle and Upper Devonian Catskill Delta. Relief is high to moderate. Drainage in the vicinity is southeastward toward the Delaware River System.

2.2 SUBSURFACE INVESTIGATION

No subsurface investigation could be located for this project. However, the "General Soil Map of New York State" prepared by Cornell University Agriculture Experiment Station indicates that the surficial soils are of the Oquaga Association. This soil association, of glacial till origin, has moderate to good drainage characteristics. Most of the area is forested and only locally in the valleys is there cultivable land.

2.3 DAM AND APPURTENANT STRUCTURES

The spillway size and general embankment was designed by Andrew Tweedie, C.E. Delmar, New York. However, the dam was reconstructed by the owner who followed the design but not the layout. The design of the dam is an earth embankment with clay core. The spillway is cut into the natural right abutment and is a stepped channel formed of stone and concrete.

2.4 CONSTRUCTION RECORDS

No construction records are available, however, Mr. William Luehmann, the constructor of the dam lives immediately adjacent to the dam.

2.5 OPERATION RECORDS

No operation records of the dam other than the accounts of Mr. William Luehmann are available.

2.6 EVALUATION OF DATA

Data presented in this report has been made available by the visual inspection of the dam, conversation with Mr. William Luehmann, and information located in the files at N.Y.S. Department of Environmental Conservation. This information appears adequate and reliable for Phase I Inspection purposes.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of the William Luehmann Recreation Pond Dam was conducted on April 30, 1981. The weather was partly cloudy and the temperature ranged in the 50's. The reservoir level was approximately 0.25 feet above the spillway crest.

b. Embankment

The embankment is circular in alignment and approximately 18 feet high at its maximum. The area where the original drop inlet spillway was replaced with the steel reservoir drain is quite steep and showing some signs of erosion. There are some trees and brush growing on the embankment and spur between the reservoir drain and spillway channel.

c. Seepage

No seepage could be found along the abutment contacts or at the toe of the embankment. During the inspection, due to flow in the spillway, it could not be determined if there was any signs of seepage under or around the spillway channel.

d. Spillway

The approach channel and spillway appeared to be in fair condition. Although functioning well, signs of deterioration are apparent. The concrete is spalling and reinforcing is showing in several areas. The embankment adjacent to the concrete walls are in need of maintenance. Both deterioration and erosion are most apparent at the downstream end of the left spillway wall (Photo# 3) The apron and steps could not be seen at the time of investigation. It is unknown precisely what condition they are in.

e. Reservoir Drain

The reservoir drain consists of an 18" steel pipe located in the center of the embankment. It was placed in 1980 after the original 30" CMP had deteriorated to the point of collapsing. The intake consists of a 4 feet box which is covered with a 1/2 inch steel plate. This plate can be removed by means of a cable which runs to the left spillway abutment.

f. Downstream Channel

The channel immediately below the dam flows directly into the natural channel which runs under a roadway 300 feet downstream. There is a four foot culvert under the intersection which frequently clogs with debris and backs water up to the base of the dam.

g. Reservoir

There are no visible signs of instability or sedimentation problems in the reservoir area.

3.2 EVALUATION OF OBSERVATIONS

Visual inspection of the William Luehmann Recreation Pond Dam revealed the following deficiencies:

a. The slopes at the downstream toe appear very steep and lack vegetative cover. The areas include the drain channel and left side of the spillway channel.

b. Trees and brush are growing on the embankment between the drain and spillway.

c. The concrete on the spillway is spalling and in need of maintenance.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURE

4.1 PROCEDURES

The spillway is a free overflow which requires no operation. Therefore, the normal water surface elevation is approximated by the spillway crest, 1494. feet U.S.G.S. Datum.

4.2 MAINTENANCE OF THE DAM

The dam has been maintained by Mr. William Luehmann since its raising in 1956. Maintenance, now the responsibility of Ms. Pamela Dawber, the present owner, is not considered satisfactory as evidenced by the unvegetated lower slopes, trees and brush on the embankment and deteriorated concrete of the spillway.

4.3 WARNING SYSTEM

There is no warning system in effect or preparation.

4.4 EVALUATION

The dam has not been maintained in satisfactory condition as noted in "Section 3: Visual Inspection".

SECTION 5: HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The dam is located on Sherruck Brook about 2.3 miles southwest of the Village of Trout Creek. The total drainage area of the contributing basin is 3.05 square miles. The reservoir surface area at normal pool is 32.6 acres. The basin drains generally in a south to southeasterly direction. Much of the basin is wooded with slopes ranging from mild to steep. It was analysed as a single basin.

5.2 ANALYSIS CRITERIA

The analysis of the spillway capacity of the dam and storage of the reservoir was performed using the Corps of Engineers HEC-1 computer program incorporating the "Snyder Synthetic Unit Hydrograph" method and the "Modified Puls" flood routing procedure. The floods selected for analysis were the PMF and 1/2 the PMF in accordance with the recommended guidelines of the Corps of Engineers.

5.3 SPILLWAY CAPACITY

The spillway has a capacity of 1058 cfs at top of dam. An inflow of 2874 cfs generated by a storm equal to 1/2 the PMF will produce a maximum outflow of 2860 cfs and the resulting maximum depth of water over the dam will be about 1.36 feet. An inflow of 5748 cfs resulting from the PMF will produce a maximum outflow of 5748 cfs and the resulting maximum depth of water over the dam is expected to be about 2.68 feet.

5.4 RESERVOIR CAPACITY

The storage capacity of the reservoir to normal water elevation is 130 acre-feet. Surcharge storage to top of dam is an additional 232 acre-feet, creating a total storage of 362 acre-feet. The surcharge storage between the crest of the spillway and the dam is equivalent to 1.43 inches of runoff.

5.5 FLOODS OF RECORD

No records of past flooding in Sherruck Brook are available.

5.6 OVERTOPPING POTENTIAL

Our analysis indicates that the dam will be overtopped by about 1.36 feet of water during a storm equal to 1/2 the PMF in magnitude. A storm as large as the PMF is expected to increase this overtopping to about 2.68 feet.

5.7 EVALUATION

The spillway is inadequate to handle flows produced by the PMF as well as 1/2 the PMF since the overtopping of the dam caused by these storms would, besides endangering the dam, create flooding problems at some of the homes located downstream.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF VISUAL INSPECTION

a. Visual Observation
The steep slopes around the drain outlet and left spillway channel wall should be graded and seeded. Although there seemed to be no active erosion in these areas, the slopes should be protected.

b. Design and Construction Data
No information could be located regarding the stability of the structure.

c. Operating Records
No operating problems were reported which would affect the stability of the dam.

d. Post Construction Changes
The original dam was raised in 1956 to its present height. The spillway was constructed in 1970 and the 30 inch CMP drain was replaced with the 18 inch steel drain in 1980.

e. Seismic Stability
The structure is located in Zone 1 on the Corps of Engineers' seismic map. No stability analysis was performed for this structure.

SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

The Phase I Inspection of the William H. Luehmann Recreation Pond Dam revealed that the spillway is " seriously inadequate", based upon the Corps of Engineer's screening criteria. The outflows from any storm in excess of 28% of the PMF will overtop the dam. This overtopping could cause breaching of the dam and the resulting flood wave would significantly increase the hazard to downstream residents. For these reasons, the dam has been assessed as unsafe, non-emergency.

In addition,the dam has a number of problem areas which, if left uncorrected, have the potential for the development of hazardous conditions. These areas are:

1. The slopes at the downstream toe appear very steep and lack vegetative cover. These areas include the drain channel and left side of the spillway channel.

2. Trees and brush growing on the embankment between the drain and spillway.

3. The deteriorated concrete on the spillway-walls and stepped channel.

b. Adequacy of Information

The information reviewed is considered adequate for Phase I Inspection purposes.

c. Need for Additional Investigations

Since the spillway is considered to be "seriously inadequate", an additional hydrologic/hydraulic investigation is required to more accurately determine the site specific characteristics of the watershed. The result of the investigation will determine the appropriate remedial measures for the spillway.

d. Urgency

The additional hydrologic/hydraulic investigation must be initiated within six months from the date of notification. Within 1 year of notification, remedial measures as a result of these investigations must be initiated with completion of the measures during the following year. In the interim, develop an emergency action plan for notification of downstream residents and proper governmental authorities in the event of overtopping and provide round-the-clock surveillance of the dam during extreme runoff. The other problem areas listed below must be corrected within one year from notification.

7.2 RECOMMENDED MEASURES

1. The results of the hydrologic/hydraulic investigation will determine the appropriate remedial actions for the spillway.

2. Backfill the slopes at the downstream toe and seed.

3. Remove trees and brush on embankment between the drain and spillway.

4. Repair spalling concrete on spillway walls.

APPENDIX A

PHOTOGRAPHS

PHOTO 2 - OVERVIEW OF SPILLWAY AND DOWNSTREAM CHANNEL

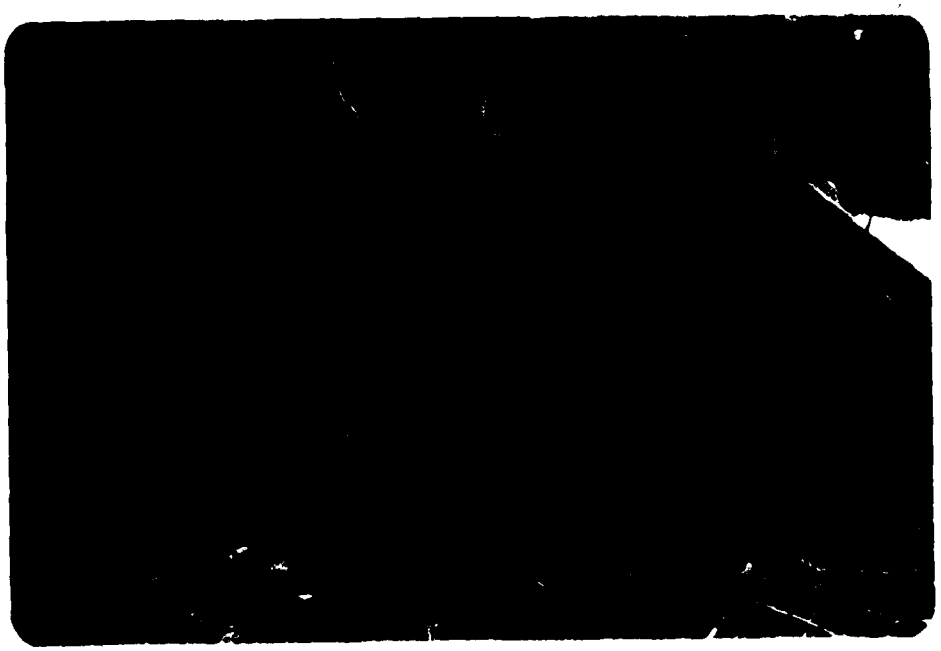

PHOTO 3 - LEFT SPILLWAY ABUTMENT
NOTE: DETERIORATION OF CONCRETE

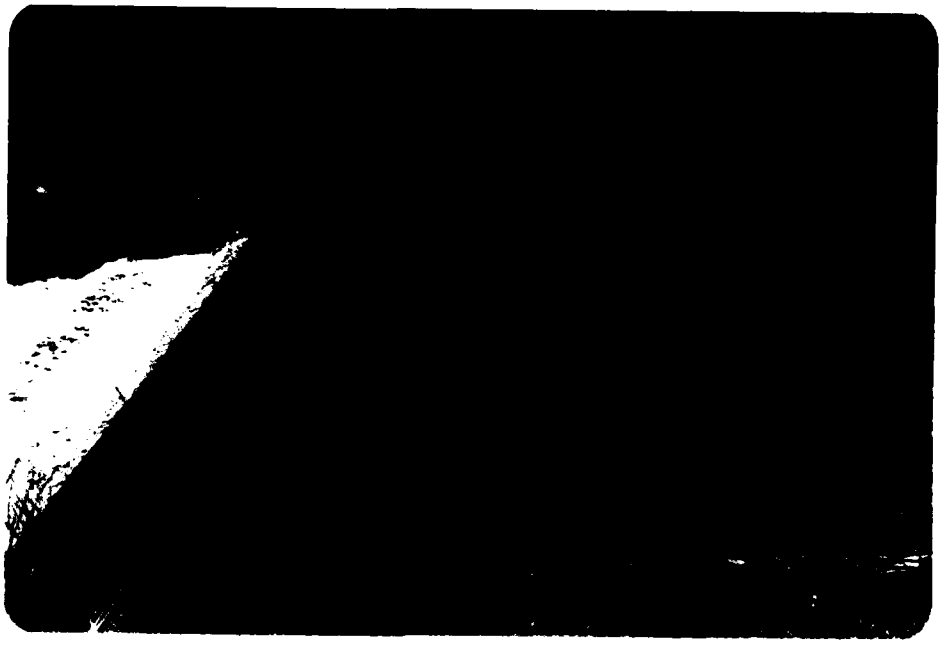

PHOTO 4 - RIGHT SPILLWAY ABUTMENT
NOTE: DETERIORATION OF CONCRETE

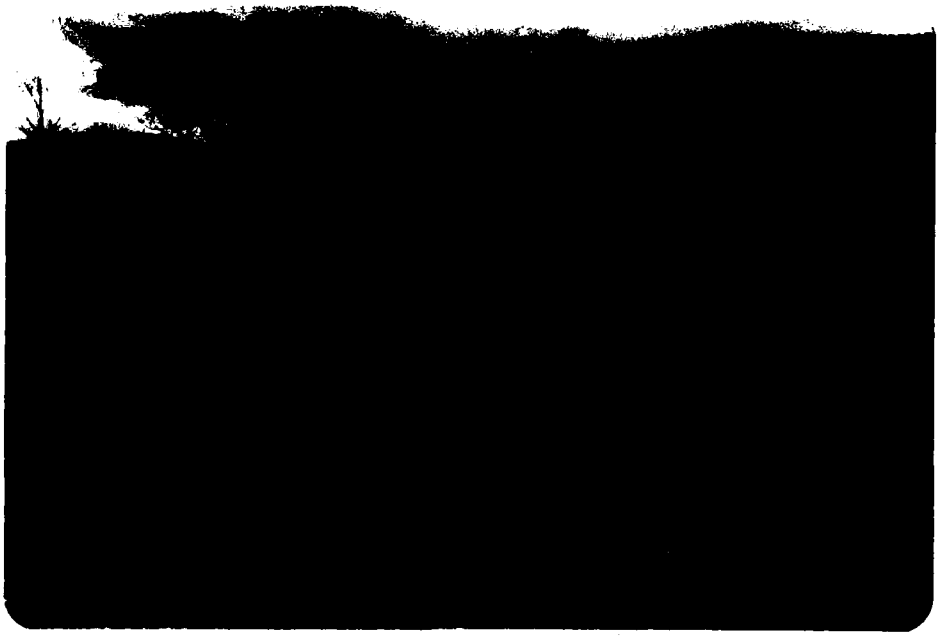

PHOTO 5 - SPILLWAY APPROACH CHANNEL

PHOTO 6 - DOWNSTREAM VIEW OF DAM
SPILLWAY ON LEFT, DRAIN OUTLET CHANNEL ON RIGHT

PHOTO 7 - DOWNSTREAM TOE OF EMBANKMENT
NOTE: STEEPNESS AND LACK OF VEGETATIVE COVER AT TOE

PHOTO 8 - CLOSEUP OF RESERVOIR DRAIN OUTLET

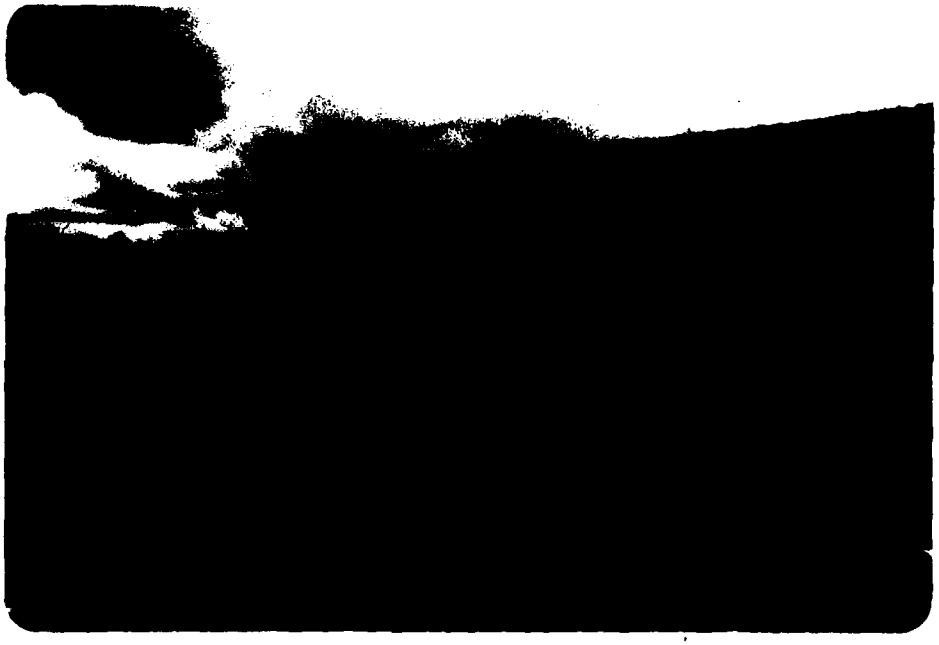

PHOTO 9 - DOWNSTREAM SLOPE OF CIRCULAR EMBANKMENT

PHOTO 10 - RESERVOIR FROM CREST OF EMBANKMENT

APPENDIX B

VISUAL INSPECTION CHECKLIST

93-15-3(9/80)

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam William Luehmann Rec. Pd Dam.

Fed. I.D. # NY 1199 DEC Dam No. 119B-1337

River Basin DELAWARE

Location: Town TOMPKINS County DELAWARE

Stream Name SHERRUCK BROOK

Tributary of CANNONSVILLE RESERVOIR

Latitude (N) 42°10.8' Longitude (W) 75°18.7'

Type of Dam EARTHFILL

Hazard Category 'C' - high

Date(s) of Inspection APRIL 30, 1981

Weather Conditions PARTIALLY CLOUDY - 50's°

Reservoir Level at Time of Inspection 0.25' OVER SPILLCREST

b. Inspection Personnel KEN HARMER JAMIE VEITCH

c. Persons Contacted (Including Address & Phone No.)

William Luehmann

d. History:

Date Constructed ? Date(s) Reconstructed 1956 - RAISED

1970 - NEW SPILLWAY

1980 - NEW RES. DRAIN

Designer ANDREW D. Tweedie / William Luehmann

Constructed By William Luehmann

Owner Pamela Dawber, 9911 W. Pico Blvd., P.H.A. Los Angeles CA.

93-15-3(9/80)

2) Embankment

a. Characteristics

(1) Embankment Material EARTH FILL

(2) Cutoff Type NONE

(3) Impervious Core CLAY CORE

(4) Internal Drainage System NONE

(5) Miscellaneous fill around drain outlet to reduce slope

b. Crest

(1) Vertical Alignment good

(2) Horizontal Alignment circular - good.

(3) Surface Cracks NONE

(4) Miscellaneous

c. Upstream Slope

(1) Slope (Estimate) (V:H)

(2) Undesirable Growth or Debris, Animal Burrows trees + brush on spur between spillway channel & drain channel

(3) Sloughing, Subsidence or Depressions NONE

93-15-3(9/80)

(4) Slope Protection well vegetated except for lower downstream slope around drain.

(5) Surface Cracks or Movement at Toe NONE

d. Downstream Slope

(1) Slope (Estimate - V:H)

(2) Undesirable Growth or Debris, Animal Burrows NONE

(3) Sloughing, Subsidence or Depressions NONE

(4) Surface Cracks or Movement at Toe None

(5) Seepage NONE

(6) External Drainage System (Ditches, Trenches; Blanket) NONE

(7) Condition Around Outlet Structure needs to be backfilled

(8) Seepage Beyond Toe NONE

e. Abutments - Embankment Contact

good

93-15-3(9/80)

(1) Erosion at Contact NONE

(2) Seepage Along Contact NONE FOUND

3) Drainage System

a. Description of System None

b. Condition of System —

c. Discharge from Drainage System —

4) Instrumentation (Momumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.)

None

93-15-3(9/80)

5) **Reservoir**

a. Slopes shallow

b. Sedimentation NOT A PROBLEM AT PRESENT

c. Unusual Conditions Which Affect Dam NONE

6) **Area Downstream of Dam**

a. Downstream Hazard (No. of Homes, Highways, etc.) several low lying homes, channel makes several road crossings

b. Seepage, Unusual Growth None

c. Evidence of Movement Beyond Toe of Dam NONE

d. Condition of Downstream Channel good

7) **Spillway(s) (Including Discharge Conveyance Channel)**

a. General some deterioration of walls

b. Condition of Service Spillway

93-15-3(9/80)

c. Condition of Auxiliary Spillway NONE

d. Condition of Discharge Conveyance Channel good

8) Reservoir Drain/Outlet

Type: Pipe ✓ Conduit _____ Other _____

Material: Concrete _____ Metal steel Other _____

Size: 18" Length _____

Invert Elevations: Entrance ? Exit _____

Physical Condition (Describe): good Unobservable _____

Material: steel

Joints: _____ Alignment good

Structural Integrity: good (new) 1980

Hydraulic Capability: —

Means of Control: Gate ✓ Valve _____ Uncontrolled _____

Operation: Operable ✓ Inoperable _____ Other _____

Present Condition (Describe): good

9) Structural

a. Concrete Surfaces spillway deteriorated

b. Structural Cracking —

c. Movement - Horizontal & Vertical Alignment (Settlement) —

d. Junctions with Abutments or Embankments —

e. Drains - Foundation, Joint, Face —

f. Water Passages, Conduits, Sluices —

g. Seepage or Leakage NONE

h. Joints - Construction, etc. NONE

i. Foundation —

j. Abutments good -

k. Control Gates operable (removable plate)

l. Approach & Outlet Channels good

m. Energy Dissipators (Plunge Pool, etc.) good - stepped spillway channel

n. Intake Structures operable (drain)

o. Stability good

p. Miscellaneous

10) Appurtenant Structures (Power House, Lock, Gatehouse, Other)

a. Description and Condition None

11) Operation Procedures (Lake Level Regulation):

NONE

APPENDIX C

HYDROLOGIC/HYDRAULIC

ENGINEERING DATA AND COMPUTATIONS

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	1500	45.00	362
2) Design High Water (Max. Design Pool)	—	—	—
3) Auxiliary Spillway Crest	—	—	—
4) Pool Level with Flashboards	—	—	—
5) Service Spillway Crest	1494	32.60	130

DISCHARGES

	Volume (cfs)
1) Average Daily	—
2) Spillway @ Maximum High Water	1058
3) Spillway @ Design High Water	—
4) Spillway @ Auxiliary Spillway Crest Elevation	—
5) Low Level Outlet	36
6) Total (of all facilities) @ Maximum High Water	1094
7) Maximum Known Flood	—
8) At Time of Inspection	18

CREST: ELEVATION: 1500

Type: Earth

Width: 12 ft Length: 300 ft

Spillover —

Location —

SPILLWAY:

SERVICE		AUXILIARY
1494	Elevation	None
Concrete, Broad-Crested	Type	
24 ft	Width	
	Type of Control	
✓	Uncontrolled	
	Controlled:	
—	Type (Flashboards; gate)	
—	Number	
—	Size/Length	
	Invert Material	
	Anticipated Length of operating service	
—	Chute Length	
12 ft	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	

HYDROMETEROLOGICAL GAGES:

Type : None

Location: _____

Records:

Date - _____

Max. Reading - _____

FLOOD WATER CONTROL SYSTEM:

Warning System: None

_____

Method of Controlled Releases (mechanisms):

Low level outlet
18" Steel pipe

DRAINAGE AREA: 3.05 mi^2

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Woods, open fields, Some houses downstream

Terrain - Relief: Single basin, Relief high to moderate

Surface - Soil: Oquaga Soils of glacial till origin

Runoff Potential (existing or planned extensive alterations to existing (surface or subsurface conditions)

No alterations planned or anticipated.
Drainage characteristics - moderate

Potential Sedimentation problem areas (natural or man-made; present or future)

No indication of sedimentation

Potential Backwater problem areas for levels at maximum storage capacity including surcharge storage:

None except downstream

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the Reservoir perimeter:

Location: None

Elevation: _____

Reservoir:

Length @ Maximum Pool _____ (Miles)

Length of Shoreline (@ Spillway Crest) _____ (Miles)

Willy Luehman Lake Dam

Drainage Area = $\frac{21.25 \times 24000 \times 24000}{144 \times 5280 \times 5280}$

Measured from USGS quad sheet

= 3.05 mi.^{2}

= 1,951 acres

Spillway Crest Elev. = 1494
Dam Crest elev. = 1500
Length of spillway = 24 ft.
Length of dam = 300 ft. (as per inspection by Jamie)
Max. height of dam = 18 ft.

Elev. vs. Lake Surface Area

Elev.	Surface Area (acres)
1482	0.00
1494	32.60
1500	45.00
1520	74.38

Spillway Capacity

Assume C = 3.0 (Broad Crested)

EL.	H	$H^{3/2}$	C	L	Q (cfs)
1494	0	0	3.0	24	0
1495	1	1	3.0	24	72
1496	2	2.83	3.0	24	204
1497	3	5.20	3.0	24	374
1498	4	8.00	3.0	24	576
1499	5	11.18	3.0	24	805
1500	6	14.70	3.0	24	1058
1501	7	18.52	3.0	24	1333

Drainage Area = 3.05 mi^2

Precipitation: Σ PMP = 21.4" (H.M. No. 33)

DUR.	6	12	24	48
%	111	123	133	142

$$L_{CA} = \frac{3.7 \times 2000}{5280} = 1.40 \text{ mi.}$$

$$L = \frac{7.65 \times 2000}{5280} = 2.90 \text{ mi.}$$

Assume $C_t = 2.0$ $C_p = 0.625$

$$t_p = C_t (L \times L_{CA})^{0.3}$$

$$= 2 \times (\underline{2.9 \times 1.4})^{0.3} = 3.05 \text{ hr.}$$

$$t_r = \frac{t_p}{5.5} = \frac{3.05}{5.5} = 0.55 \text{ hr.}$$ <u>Use 30 mins</u>

$$T_p = t_p + 0.25 (t_R - t_r)$$

$$= 3.05 + 0.25 (0.50 - 0.55)$$

$$= 3.05 - 0.25 \times 0.05$$

$$= 3.05 - 0.01$$

$$= 3.04 \text{ hr.}$$

$$TF = 1 - \frac{0.3008}{(3.05)^{0.17718}}$$

$$= 0.753 \text{, say } 0.80$$

[Let computer use 0.80 for drainage area < 10 sq. mils]

Willy Luehman Lake Dam (1)

```
*****************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
  MODIFIED FOR HONEYWELL APR 79
*****************************
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*****************************
NEW YORK STATE
DEPT OF ENVIRONMENTAL CONSERVATION
FLOOD PROTECTION BUREAU
*****************************
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1	A1	WILLY LUEHMAN LAKE DAM									
2	A2	PHASE 1									
3	A3	PMF									
4	B	200	0	30	0	0	0	0	0	0	0
5	B1	5									
6	J	1	6	1							
7	J1	.2	.4	.5	.6	.8	1				
8	K		1			2	2	1			
9	K1	INFLOW FROM BASIN									
10	M	1	1	3.05							
11	P		21.4	111	123	133	142				
12	T							1	.1		
13	W	3.06	.625								
14	X	-2	-.1	2.5							
15	K	1	1			2	2	1			
16	K1	ROUTE THROUGH RESERVOIR									
17	Y				1	1					
18	Y1	1						-1494	-1		
19	Y4	1494	1495	1496	1497	1498	1499	1500	1501		
20	Y5		72	204	374	516	805	1058	1333		
21	SA	0	32.6	45.0	74.38						
22	SE	1482	1494	1500	1520						
23	SS	1494									
24	SD	1500	3	1.5	300						
25	K	99									
26	A										
27	A										
28	A										
29	A										

```
*******************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
  MODIFIED FOR HONEYWELL APR 79
*******************************

RUN  DATE 07/27/81
                    WILLY LLEHMAN LAKE DAM
                    PHASE 1
                    PMF

                                  JOB SPECIFICATION
          NQ     NHR    NPIP    IDAY     IHR    IMIN   METRC    IPLT    IPRT   NSTAN
         200       0      30       0       0       0       0       0       0       0
                                JOPER     NWT   LROPT   TRACE
                                    5       0       0       0

                          MULTI-PLAN ANALYSES TO BE PERFORMED
                              NPLAN= 1 NRTIO= 6 LRTIO= 1
                    RTIOS=   0.20   0.40   0.50   0.60   0.80   1.00

*********          *********          *********          *********          *********

                              SUB-AREA RUNOFF COMPUTATION

              INFLOW FROM BASIN
                          ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                              1       0       0       0       2       2       1       0       0

                                   HYDROGRAPH DATA
            IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
                1       1    3.05      0.    3.05      0.      0.       0       0       0

                                      PRECIP DATA
                     SPFE     PPS      R6     R12     R24     R48     R72     R96
                      0.    21.40  111.00  123.00  133.00  142.00     0.      0.
TRSPC COMPUTED BY THE PROGRAM IS 0.800

                                      LOSS DATA
          LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
              0      0.      0.    1.00      0.      0.    1.00    1.00    0.10      0.      0.

                                 UNIT HYDROGRAPH DATA
                          TP=  3.06    CP=0.63    NTA=  0

                                   RECESSION DATA
                        STRTQ=   -2.00    QRCSN=   -0.10    RTIOR= 2.50
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.99 AND R= 5.54 INTERVALS

          UNIT HYDROGRAPH 34 END-OF-PERIOD ORDINATES, LAG=   3.03 HOURS, CP= 0.62  VOL= 1.00
      25.     91.    181.    277.    357.    402.    406.    363.    303.    253.
     211.    176.    147.    123.    102.     85.     71.     60.     50.     41.
      35.     29.     24.     20.     17.     14.     12.     10.      8.      7.
       6.      5.      4.      3.

                                END-OF-PERIOD FLOW
                                  COMP Q    AVG Q   PERIOD   RAIN   EXCS   LOSS   COMP Q
```

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*******************************
NEW YORK STATE
DEPT OF ENVIRONMENTAL CONSERVATION
FLOOD PROTECTION BUREAU
*******************************
```

1.01	0.30	1	0.00	0.	0.00	6.
1.01	1.00	2	0.00	0.	0.00	5.
1.01	1.30	3	0.00	0.	0.00	5.
1.01	2.00	4	0.00	0.	0.00	4.
1.01	2.30	5	0.00	0.	0.00	4.
1.01	3.00	6	0.00	0.	0.00	4.
1.01	3.30	7	0.00	0.	0.00	3.
1.01	4.00	8	0.00	0.	0.00	3.
1.01	4.30	9	0.00	0.	0.00	3.
1.01	5.00	10	0.00	0.	0.00	2.
1.01	5.30	11	0.00	0.	0.00	2.
1.01	6.00	12	0.00	0.	0.00	2.
1.01	6.30	13	0.01	0.	0.01	2.
1.01	7.00	14	0.01	0.	0.01	2.
1.01	7.30	15	0.01	0.	0.01	2.
1.01	8.00	16	0.01	0.	0.01	1.
1.01	8.30	17	0.01	0.	0.01	1.
1.01	9.00	18	0.01	0.	0.01	1.
1.01	9.30	19	0.01	0.	0.01	1.
1.01	10.00	20	0.01	0.	0.01	1.
1.01	10.30	21	0.01	0.	0.01	1.
1.01	11.00	22	0.01	0.	0.01	1.
1.01	11.30	23	0.01	0.	0.01	1.
1.01	12.00	24	0.01	0.	0.01	1.
1.01	12.30	25	0.06	0.	0.06	1.
1.01	13.00	26	0.06	0.	0.06	1.
1.01	13.30	27	0.08	0.	0.08	1.
1.01	14.00	28	0.08	0.	0.08	0.
1.01	14.30	29	0.10	0.	0.10	0.
1.01	15.00	30	0.10	0.	0.10	0.
1.01	15.30	31	0.12	0.	0.12	0.
1.01	16.00	32	0.37	0.32	0.24	4.
1.01	16.30	33	0.09	0.04	0.05	13.
1.01	17.00	34	0.09	0.04	0.05	28.
1.01	17.30	35	0.07	0.02	0.05	48.
1.01	18.00	36	0.07	0.02	0.05	67.
1.01	18.30	37	0.01	0.	0.01	83.
1.01	19.00	38	0.01	0.	0.01	93.
1.01	19.30	39	0.01	0.	0.01	93.
1.01	20.00	40	0.01	0.	0.01	86.
1.01	20.30	41	0.01	0.	0.01	76.
1.01	21.00	42	0.01	0.	0.01	66.
1.01	21.30	43	0.01	0.	0.01	55.
1.01	22.00	44	0.01	0.	0.01	46.
1.01	22.30	45	0.01	0.	0.01	39.
1.01	23.00	46	0.01	0.	0.01	32.
1.01	23.30	47	0.01	0.	0.01	27.
1.02	0.	48	0.01	0.	0.01	22.
1.02	0.30	49	0.06	0.01	0.05	19.
1.02	1.00	50	0.06	0.01	0.05	16.
1.02	1.30	51	0.06	0.01	0.05	15.
1.02	2.00	52	0.06	0.01	0.05	15.
1.02	2.30	53	0.06	0.01	0.05	16.
1.02	3.00	54	0.06	0.01	0.05	17.
1.02	3.30	55	0.06	0.01	0.05	19.
1.02	4.00	56	0.06	0.01	0.05	20.
1.02	4.30	57	0.06	0.01	0.05	21.
1.02	5.00	58	0.06	0.01	0.05	22.
1.02	5.30	59	0.06	0.01	0.05	21.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

1.03	2.30	101	0.	0.	0.	595.
1.03	3.00	102	0.	0.	0.	535.
1.03	3.30	103	0.	0.	0.	488.
1.03	4.00	104	0.	0.	0.	446.
1.03	4.30	105	0.	0.	0.	407.
1.03	5.00	106	0.	0.	0.	371.
1.03	5.30	107	0.	0.	0.	339.
1.03	6.00	108	0.	0.	0.	309.
1.03	6.30	109	0.	0.	0.	282.
1.03	7.00	110	0.	0.	0.	257.
1.03	7.30	111	0.	0.	0.	235.
1.03	8.00	112	0.	0.	0.	214.
1.03	8.30	113	0.	0.	0.	195.
1.03	9.00	114	0.	0.	0.	178.
1.03	9.30	115	0.	0.	0.	163.
1.03	10.00	116	0.	0.	0.	148.
1.03	10.30	117	0.	0.	0.	135.
1.03	11.00	118	0.	0.	0.	124.
1.03	11.30	119	0.	0.	0.	113.
1.03	12.00	120	0.	0.	0.	103.
1.03	12.30	121	0.	0.	0.	94.
1.03	13.00	122	0.	0.	0.	86.
1.03	13.30	123	0.	0.	0.	78.
1.03	14.00	124	0.	0.	0.	71.
1.03	14.30	125	0.	0.	0.	65.
1.03	15.00	126	0.	0.	0.	59.
1.03	15.30	127	0.	0.	0.	54.
1.03	16.00	128	0.	0.	0.	49.
1.03	16.30	129	0.	0.	0.	45.
1.03	17.00	130	0.	0.	0.	41.
1.03	17.30	131	0.	0.	0.	38.
1.03	18.00	132	0.	0.	0.	34.
1.03	18.30	133	0.	0.	0.	31.
1.03	19.00	134	0.	0.	0.	29.
1.03	19.30	135	0.	0.	0.	26.
1.03	20.00	136	0.	0.	0.	24.
1.03	20.30	137	0.	0.	0.	22.
1.03	21.00	138	0.	0.	0.	20.
1.03	21.30	139	0.	0.	0.	18.
1.03	22.00	140	0.	0.	0.	16.
1.03	22.30	141	0.	0.	0.	15.
1.03	23.00	142	0.	0.	0.	14.
1.03	23.30	143	0.	0.	0.	13.
1.04	0.	144	0.	0.	0.	11.
1.04	0.30	145	0.	0.	0.	10.
1.04	1.00	146	0.	0.	0.	9.
1.04	1.30	147	0.	0.	0.	9.
1.04	2.00	148	0.	0.	0.	8.
1.04	2.30	149	0.	0.	0.	7.
1.04	3.00	150	0.	0.	0.	7.
1.04	3.30	151	0.	0.	0.	6.
1.04	4.00	152	0.	0.	0.	5.
1.04	4.30	153	0.	0.	0.	5.
1.04	5.00	154	0.	0.	0.	5.
1.04	5.30	155	0.	0.	0.	4.
1.04	6.00	156	0.	0.	0.	4.
1.04	6.30	157	0.	0.	0.	[illegible]
1.04	7.00	158	0.	0.	0.	[illegible]
1.04	7.30	159	0.	0.	0.	[illegible]
1.04	8.00	160	0.	0.	0.	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

1.02	7.00	62	0.17	0.12	0.05	38.	1.04	9.00	162	0.	0.	0.	2.
1.02	7.30	63	0.17	0.12	0.05	60.	1.04	9.30	163	0.	0.	0.	2.
1.02	8.00	64	0.17	0.12	0.05	91.	1.04	10.00	164	0.	0.	0.	2.
1.02	8.30	65	0.17	0.12	0.05	133.	1.04	10.30	165	0.	0.	0.	2.
1.02	9.00	66	0.17	0.12	0.05	178.	1.04	11.00	166	0.	0.	0.	2.
1.02	9.30	67	0.17	0.12	0.05	225.	1.04	11.30	167	0.	0.	0.	1.
1.02	10.00	68	0.17	0.12	0.05	266.	1.04	12.00	168	0.	0.	0.	1.
1.02	10.30	69	0.17	0.12	0.05	301.	1.04	12.30	169	0.	0.	0.	1.
1.02	11.00	70	0.17	0.12	0.05	330.	1.04	13.00	170	0.	0.	0.	1.
1.02	11.30	71	0.17	0.12	0.05	354.	1.04	13.30	171	0.	0.	0.	1.
1.02	12.00	72	0.17	0.12	0.05	375.	1.04	14.00	172	0.	0.	0.	1.
1.02	12.30	73	0.95	0.90	0.05	411.	1.04	14.30	173	0.	0.	0.	1.
1.02	13.00	74	0.95	0.90	0.05	496.	1.04	15.00	174	0.	0.	0.	1.
1.02	13.30	75	1.14	1.09	0.05	653.	1.04	15.30	175	0.	0.	0.	1.
1.02	14.00	76	1.14	1.09	0.05	896.	1.04	16.00	176	0.	0.	0.	1.
1.02	14.30	77	1.43	1.38	0.05	1224.	1.04	16.30	177	0.	0.	0.	1.
1.02	15.00	78	1.43	1.38	0.05	1623.	1.04	17.00	178	0.	0.	0.	1.
1.02	15.30	79	1.73	1.68	0.05	2072.	1.04	17.30	179	0.	0.	0.	0.
1.02	16.00	80	5.49	5.44	0.05	2637.	1.04	18.00	180	0.	0.	0.	0.
1.02	16.30	81	1.33	1.28	0.05	3350.	1.04	18.30	181	0.	0.	0.	0.
1.02	17.00	82	1.33	1.28	0.05	4119.	1.04	19.00	182	0.	0.	0.	0.
1.02	17.30	83	1.05	1.00	0.05	4851.	1.04	19.30	183	0.	0.	0.	0.
1.02	18.00	84	1.05	1.00	0.05	5430.	1.04	20.00	184	0.	0.	0.	0.
1.02	18.30	85	0.09	0.04	0.05	5748.	1.04	20.30	185	0.	0.	0.	0.
1.02	19.00	86	0.09	0.04	0.05	5748.	1.04	21.00	186	0.	0.	0.	0.
1.02	19.30	87	0.09	0.04	0.05	5412.	1.04	21.30	187	0.	0.	0.	0.
1.02	20.00	88	0.09	0.04	0.05	4878.	1.04	22.00	188	0.	0.	0.	0.
1.02	20.30	89	0.09	0.04	0.05	4292.	1.04	22.30	189	0.	0.	0.	0.
1.02	21.00	90	0.09	0.04	0.05	3696.	1.04	23.00	190	0.	0.	0.	0.
1.02	21.30	91	0.09	0.04	0.05	3131.	1.04	23.30	191	0.	0.	0.	0.
1.02	22.00	92	0.09	0.04	0.05	2636.	1.05	0.	192	0.	0.	0.	0.
1.02	22.30	93	0.09	0.04	0.05	2223.	1.05	0.30	193	0.	0.	0.	0.
1.02	23.00	94	0.09	0.04	0.05	1878.	1.05	1.00	194	0.	0.	0.	0.
1.02	23.30	95	0.09	0.04	0.05	1590.	1.05	1.30	195	0.	0.	0.	0.
1.03	0.	96	0.09	0.04	0.05	1350.	1.05	2.00	196	0.	0.	0.	0.
1.03	0.30	97	0.	0.	0.	1148.	1.05	2.30	197	0.	0.	0.	0.
1.03	1.00	98	0.	0.	0.	978.	1.05	3.00	198	0.	0.	0.	0.
1.03	1.30	99	0.	0.	0.	832.	1.05	3.30	199	0.	0.	0.	0.
1.03	2.00	100	0.	0.	0.	705.	1.05	4.00	200	0.	0.	0.	0.
									SUM	24.31	20.62	3.69	84257.
										(617.)	(524.)	(94.)	(2385.89)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5748.	4441.	1681.	585.	84259.
CMS	163.	126.	48.	17.	2386.
INCHES		13.54	20.51	21.40	21.42
MM		344.03	521.04	543.54	543.95
AC-FT		2202.	3335.	3479.	3482.
THOUS CU M		2716.	4114.	4291.	4295.

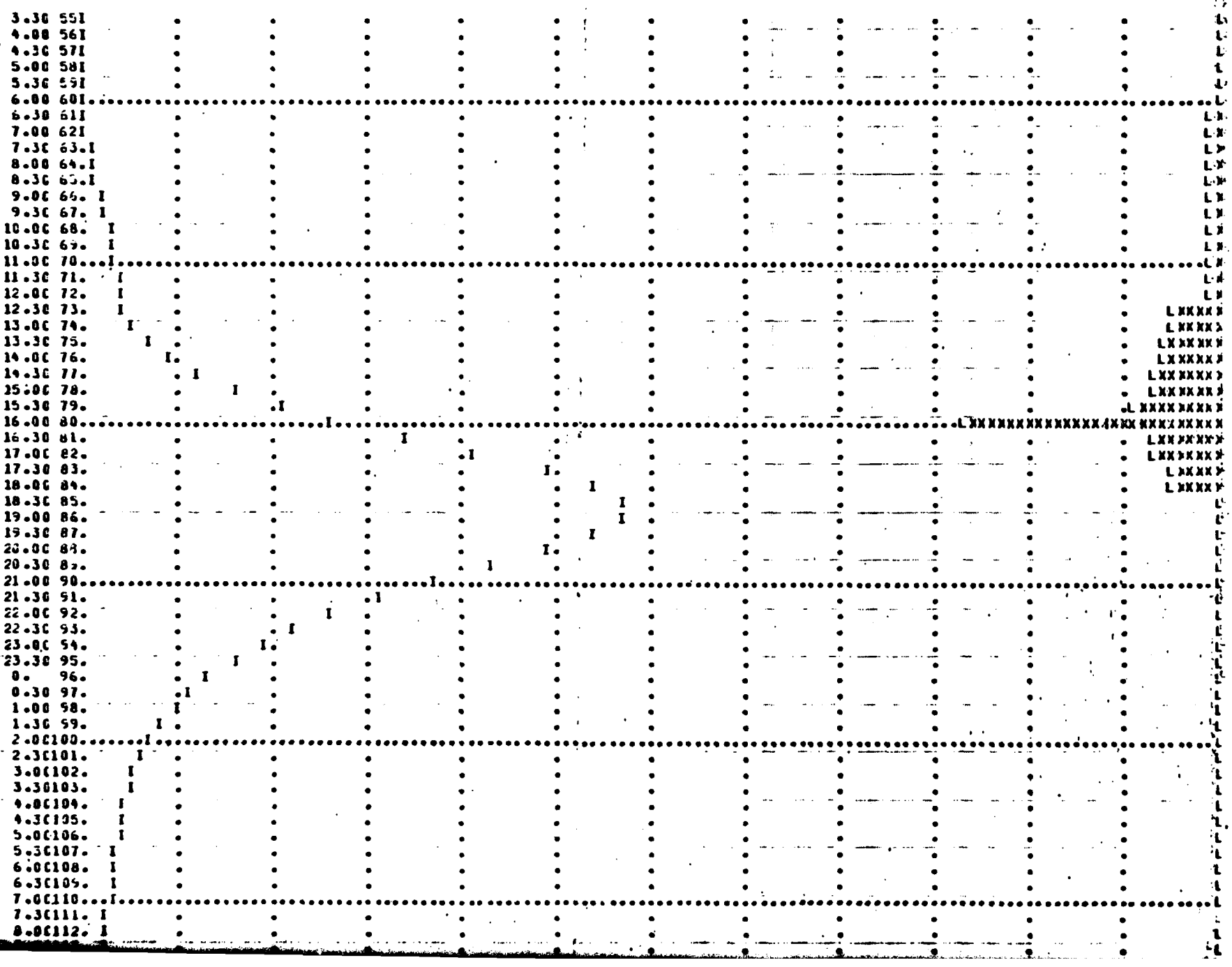
OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

PRECIP(L) AND EXCESS(X)

	0.	1000.	2000.	3000.	4000.	5000.	6000.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.	0.	6.	4.	2.	0.	
0.30	1I													L
1.00	2I													L
1.30	3I													L
2.00	4I													L
2.30	5I													L
3.00	6I													L
3.30	7I													L
4.00	8I													L
4.30	9I													L
5.00	10I													L
5.30	11I													L
6.00	12I													L
6.30	13I													L
7.00	14I													L
7.30	15I													L
8.00	16I													L
8.30	17I													L
9.00	18I													L
9.30	19I													L
10.00	20I													L
10.30	21I													L
11.00	22I													L
11.30	23I													L
12.00	24I													L
12.30	25I													L
13.00	26I													L
13.30	27I													L
14.00	28I													L
14.30	29I													L
15.00	30I													L
15.30	31I													LX
16.00	32I													LX
16.30	33I													L
17.00	34I													L
17.30	35I													L
18.00	36.I													L
18.30	37.I													L
19.00	38.I													L
19.30	39.I													L
20.00	40.I													L
20.30	41.I													L
21.00	42.I													L
21.30	43.I													L
22.00	44I													L
22.30	45I													L
23.00	46I													L
23.30	47I													L
0.	48I													L
0.30	49I													L
1.00	50I													
1.30	51I													
2.00	52I													
2.30	53I													



10.0C116.I
10.3C117.I
11.0C118.I
11.3C119.I
12.0C120.I
12.3C121.I
13.0C122.I
13.3C123.I
14.0C124.I
14.3C125.I
15.0C126.I
15.3C127.I
16.0C128I
16.3C129I
17.0C130I
17.3C131I
18.0C132I
18.3C133I
19.0C134I
19.3C135I
20.0C136I
20.3C137I
21.00138I
21.3C139I
22.0C140I
22.3C141I
23.0C142I
23.3C143I
0. 144I
0.3C145I
1.00146I
1.3C147I
2.0C148I
2.3C149I
3.00150I
3.3C151I
4.0C152I
4.3C153I
5.00154I
5.3C155I
6.00156I
6.3C157I
7.00158I
7.3C159I
8.0C160I
8.3C161I
9.00162I
9.3C163I
10.00164I
10.30165I
11.00166I
11.3C167I
12.0C168I
12.30169I
13.0C170I
13.3C171I
14.0C172I
14.3C173I
15.0C174I

```
16.3C177I
17.0C178I
17.3C179I
18.0C180I
18.3C181I
19.0C182I
19.3C183I
20.0C184I
20.3C185I
21.0C186I
21.3C187I
22.0C188I
22.3C189I
23.0C190I
23.3C191I
.0.  192I
 0.3C193I
 1.3C194I
 1.3C195I
 2.0C196I
 2.3C197I
 3.0C198I
 3.3C199I
 4.0C200I
```

DUN

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

1.	1.	1.	1.	1.	1.	1.	1.	1.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	3.	6.	10.	13.	17.	19.	19.	17.
15.	13.	11.	9.	8.	6.	5.	4.	4.	3.
3.	3.	3.	3.	4.	4.	4.	4.	5.	5.
6.	8.	12.	18.	27.	36.	45.	53.	60.	66.
71.	75.	82.	99.	131.	175.	245.	325.	414.	527.
670.	824.	970.	1086.	1150.	1150.	1082.	976.	858.	739.
626.	527.	445.	376.	318.	270.	230.	196.	166.	141.
119.	107.	96.	89.	81.	74.	68.	62.	56.	51.
47.	43.	39.	36.	33.	30.	27.	25.	23.	21.
19.	17.	16.	14.	13.	12.	11.	10.	9.	8.
8.	7.	6.	6.	5.	5.	4.	4.	4.	3.
3.	3.	3.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1150.	888.	336.	117.	16852.
CMS	33.	25.	10.	3.	477.
INCHES		2.71	4.10	4.28	4.28
MM		68.81	104.21	108.71	108.79
AC-FT		440.	667.	696.	696.
THOUS CU M		543.	823.	858.	859.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

2.	2.	2.	2.	2.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	5.	11.	19.	27.	33.	37.	37.	34.
31.	26.	22.	18.	15.	13.	11.	9.	8.	7.
6.	6.	6.	7.	7.	8.	9.	9.	9.	10.
11.	15.	24.	37.	53.	71.	90.	107.	120.	132.
142.	150.	164.	198.	261.	356.	490.	649.	829.	1055.
1340.	1647.	1940.	2172.	2299.	2299.	2165.	1951.	1717.	1478.
1252.	1054.	885.	751.	636.	540.	459.	391.	333.	282.
238.	214.	195.	178.	163.	148.	135.	124.	113.	103.
94.	86.	78.	71.	65.	59.	54.	49.	45.	41.
38.	34.	31.	29.	26.	24.	22.	20.	18.	16.
15.	14.	13.	11.	10.	9.	9.	8.	7.	7.
6.	5.	5.	5.	4.	4.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2299.	1776.	673.	234.	33704.
CMS	65.	50.	19.	7.	954.
INCHES		5.42	8.21	8.56	8.57
MM		[illegible]	[illegible]	[illegible]	[illegible]

THOUS CU M	1087.	1646.	1717.	1718.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

3.	3.	2.	2.	2.	2.	2.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	2.	7.	14.	24.	34.	42.	46.	46.	43.
38.	33.	28.	23.	19.	16.	13.	11.	5.	8.
8.	7.	8.	9.	9.	10.	11.	11.	12.	12.
14.	19.	30.	46.	66.	89.	112.	133.	151.	165.
177.	187.	206.	248.	327.	448.	612.	811.	1036.	1318.
1675.	2059.	2425.	2715.	2874.	2874.	2706.	2439.	2146.	1848.
1565.	1319.	1111.	939.	795.	675.	574.	489.	416.	353.
298.	268.	244.	223.	203.	186.	169.	154.	141.	129.
117.	107.	98.	89.	81.	74.	68.	62.	56.	51.
47.	43.	39.	36.	33.	30.	27.	25.	23.	21.
19.	17.	16.	14.	13.	12.	11.	10.	9.	8.
8.	7.	6.	6.	5.	5.	4.	4.	4.	3.
3.	3.	3.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2874.	2220.	841.	252.	42130.
CMS	81.	63.	24.	8.	1193.
INCHES		6.77	10.26	10.70	10.71
MM		172.02	260.52	271.77	271.98
AC-FT		1101.	1668.	1740.	1741.
THOUS CU M		1358.	2057.	2146.	2147.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

3.	3.	3.	3.	2.	2.	2.	2.	2.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	2.	8.	17.	29.	40.	50.	56.	56.	52.
46.	39.	33.	28.	23.	19.	16.	13.	11.	10.
9.	9.	9.	10.	11.	12.	13.	13.	14.	14.
17.	23.	36.	55.	80.	107.	135.	160.	181.	158.
213.	225.	247.	298.	393.	538.	724.	974.	1243.	1582.
2010.	2471.	2911.	3258.	3449.	3449.	3247.	2927.	2575.	2217.
1879.	1582.	1334.	1127.	954.	810.	689.	587.	499.	423.
357.	321.	293.	267.	244.	223.	203.	185.	169.	154.
141.	128.	117.	107.	98.	89.	81.	74.	68.	62.
56.	51.	47.	43.	39.	36.	33.	30.	27.	25.
23.	21.	19.	17.	16.	14.	13.	12.	11.	10.
9.	8.	8.	7.	6.	6.	5.	5.	4.	4.
4.	3.	3.	3.	2.	2.	2.	2.	2.	2.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3449.	2665.	1009.	351.	50555.
CMS	98.	75.	29.	10.	1432.
INCHES		8.13	12.31	12.84	12.85
MM		[illegible]	[illegible]	[illegible]	[illegible]

AC-FT	1321.	2001.	2087.	2089.
THOUS CU M	1630.	2468.	2575.	2577.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

4.	4.	4.	3.	3.	3.	3.	2.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	3.	10.	23.	38.	54.	67.	74.	74.	69.
61.	53.	44.	37.	31.	26.	21.	18.	15.	13.
12.	12.	13.	14.	15.	16.	17.	18.	19.	19.
22.	31.	48.	73.	106.	143.	180.	213.	241.	264.
284.	300.	325.	397.	523.	717.	979.	1298.	1657.	2109.
2680.	3295.	3881.	4344.	4599.	4598.	4329.	3903.	3434.	2957.
2505.	2109.	1778.	1503.	1272.	1080.	919.	782.	665.	564.
476.	428.	391.	357.	325.	297.	271.	247.	225.	206.
188.	171.	156.	143.	130.	119.	108.	99.	90.	82.
75.	69.	63.	57.	52.	47.	43.	40.	36.	33.
30.	27.	25.	23.	21.	19.	17.	16.	14.	13.
12.	11.	10.	9.	8.	8.	7.	6.	6.	5.
5.	4.	4.	4.	3.	3.	3.	3.	2.	2.
2.	2.	2.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4559.	3553.	1345.	468.	67407.
CMS	130.	101.	38.	13.	1909.
INCHES		10.84	16.41	17.12	17.13
MM		275.23	416.84	434.83	435.16
AC-FT		1752.	2668.	2783.	2785.
THOUS CU M		2173.	3291.	3433.	3436.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

6.	5.	5.	4.	4.	4.	3.	3.	3.	2.
2.	2.	2.	2.	2.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	0.	0.	0.
0.	4.	13.	28.	48.	67.	83.	93.	93.	86.
76.	66.	58.	46.	39.	32.	27.	22.	19.	16.
15.	15.	16.	17.	19.	20.	21.	22.	23.	24.
28.	38.	60.	91.	133.	178.	225.	266.	301.	330.
354.	375.	411.	496.	653.	956.	1224.	1623.	2072.	2637.
3350.	4119.	4851.	5430.	5748.	5748.	5412.	4878.	4292.	3656.
3131.	2636.	2223.	1878.	1590.	1350.	1148.	978.	832.	705.
595.	535.	488.	446.	407.	371.	339.	309.	282.	257.
235.	214.	195.	178.	163.	148.	135.	124.	113.	103.
94.	86.	78.	71.	65.	55.	54.	49.	45.	41.
38.	34.	31.	29.	26.	24.	22.	20.	18.	16.
15.	14.	13.	11.	10.	9.	9.	8.	7.	7.
6.	5.	5.	5.	4.	4.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5748.	4441.	1681.	[illegible]	[illegible]
CMS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

MM	344.03	521.04	543.54	543.95
AC-FT	2202.	3335.	3479.	3482.
THOUS CU M	2716.	4114.	4251.	4295.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE THROUGH RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	1	0	0	2	2	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.	0.	0.	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.	0.	0.	-1454.	-1

STAGE	1494.00	1495.00	1496.00	1497.00	1498.00	1499.00	1500.00	1501.00
FLOW	0.	72.00	204.00	374.00	576.00	805.00	1058.00	1333.00
SURFACE AREA=	0.	33.	45.	74.				
CAPACITY=	0.	130.	362.	1544.				
ELEVATION=	1482.	1494.	1500.	1520.				

CREL	SPILLID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1494.0	0.	0.	0.	0.	0.	0.	0.

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1500.0	3.0	1.5	300.

STATION 1, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	2.	3.	5.	6.	7.
8.	8.	9.	9.	9.	9.	8.	8.	8.	7.
7.	7.	6.	6.	6.	6.	6.	5.	5.	5.
5.	5.	6.	7.	8.	10.	13.	16.	19.	23.
27.	31.	35.	40.	46.	55.	68.	97.	136.	183.
251.	335.	438.	550.	665.	763.	836.	878.	886.	867.
827.	776.	717.	655.	591.	534.	480.	429.	381.	342.
306.	273.	243.	217.	196.	180.	164.	150.	137.	125.
114.	104.	95.	87.	79.	72.	68.	65.	62.	58.
55.	52.	49.	46.	43.	41.	38.	36.	34.	32.
30.	28.	26.	24.	23.	21.	20.	18.	17.	16.
15.	14.	13.	12.	11.	10.	10.	9.	8.	8.
7.	7.	6.	6.	5.	5.	4.	4.	4.	4.
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.

1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STORAGE

130.	130.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	131.	131.	131.	131.	131.	131.	130.
130.	130.	131.	131.	131.	131.	132.	132.	133.	133.
134.	134.	134.	134.	134.	134.	134.	134.	134.	134.
134.	133.	133.	133.	133.	133.	133.	133.	133.	133.
133.	133.	133.	133.	134.	135.	136.	138.	139.	141.
143.	145.	146.	149.	152.	156.	162.	170.	181.	194.
210.	228.	245.	271.	293.	311.	324.	331.	332.	329.
322.	313.	302.	291.	279.	268.	258.	248.	238.	230.
222.	214.	208.	202.	197.	193.	189.	185.	181.	178.
175.	173.	170.	168.	166.	164.	162.	161.	159.	157.
156.	154.	153.	152.	150.	149.	148.	147.	146.	145.
144.	143.	142.	141.	141.	140.	139.	139.	138.	138.
137.	137.	136.	136.	135.	135.	135.	134.	134.	134.
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131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	131.	130.	130.	130.	130.	130.	130.

STAGE

1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
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1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1
1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1
1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.2	1494.2	1494.3	1494.3
1494.4	1494.4	1494.5	1494.6	1494.6	1494.8	1494.9	1495.2	1495.5	1495.8
1496.3	1496.8	1497.3	1497.9	1498.4	1498.8	1499.1	1499.3	1495.3	1495.2
1499.1	1498.9	1498.6	1498.3	1498.1	1497.8	1497.5	1497.3	1497.0	1496.8
1496.6	1496.4	1496.2	1496.1	1495.9	1495.8	1495.7	1495.6	1495.5	1495.4
1495.3	1495.2	1495.2	1495.1	1495.1	1495.0	1495.0	1494.9	1494.9	1494.8
1494.8	1494.7	1494.7	1494.6	1494.6	1494.6	1494.5	1494.5	1494.5	1494.4
1494.4	1494.4	1494.4	1494.3	1494.3	1494.3	1494.3	1494.3	1494.2	1494.2
1494.2	1494.2	1494.2	1494.2	1494.2	1494.1	1494.1	1494.1	1494.1	1494.1
1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0

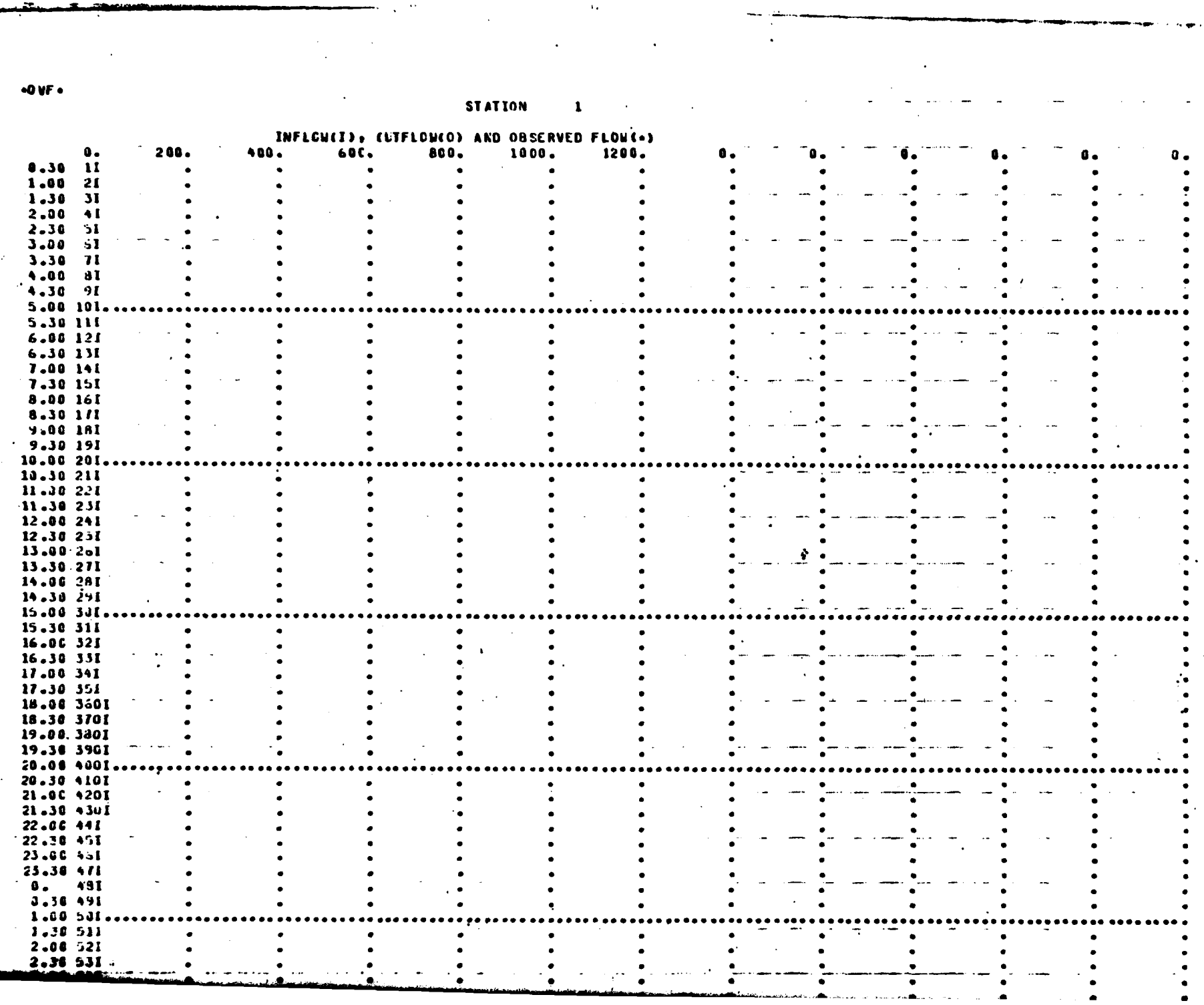
PEAK OUTFLOW IS 886. AT TIME 44.50 HOURS

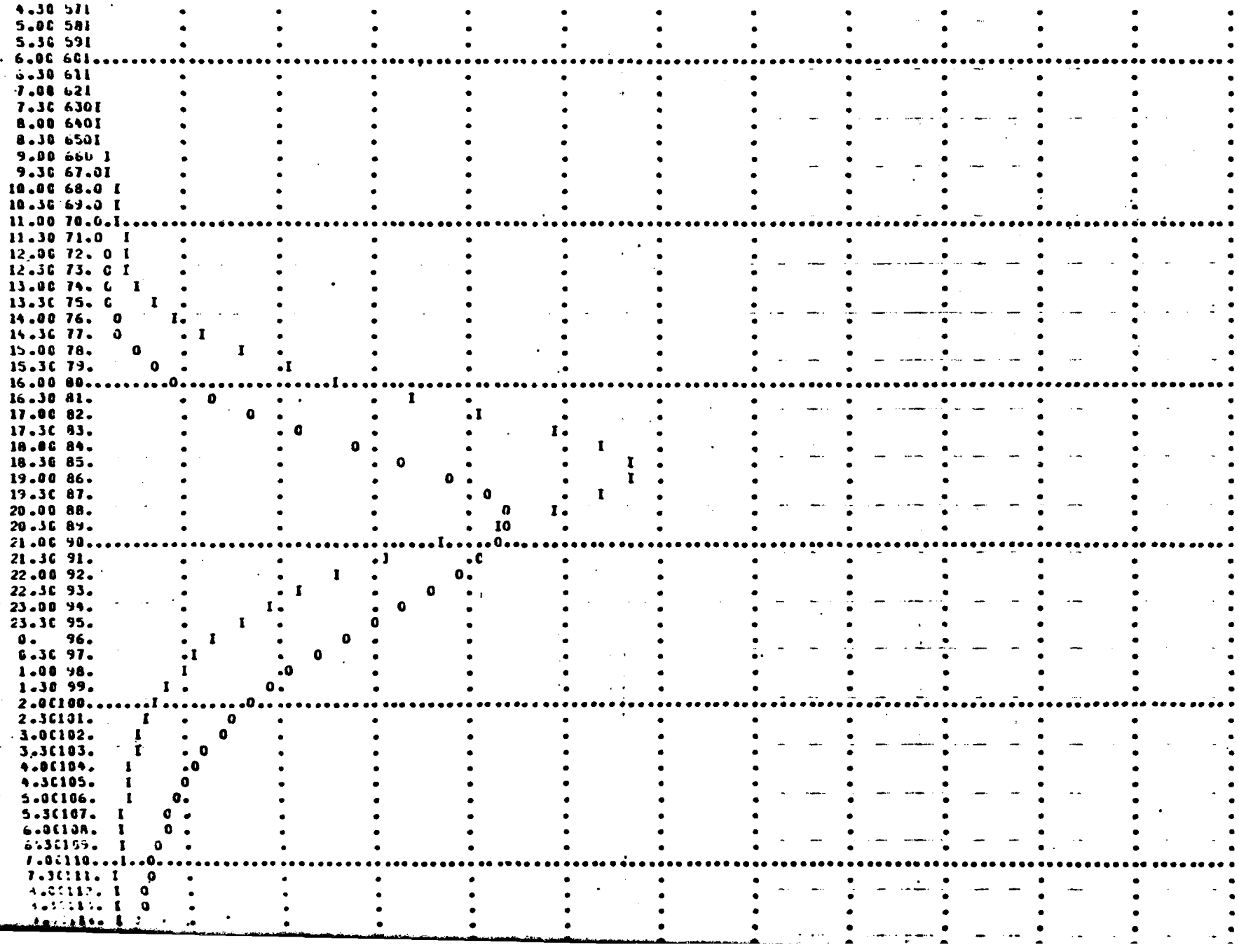
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	886.	750.	327.	117.	16854.
CMS	25.	21.	9.	3.	477.
INCHES		2.29	3.99	4.28	4.28
MM		58.12	101.32	108.67	108.80
AC-FT		372.	649.	696.	696.
THOUS CU M		459.	800.	858.	859.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)





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 4.002001
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OVN

STATION 1, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	0.	0.	0.
0.	0.	1.	1.	3.	4.	7.	9.	11.	14.
15.	16.	17.	17.	17.	17.	17.	16.	15.	15.
14.	13.	13.	12.	12.	11.	11.	11.	11.	11.
11.	11.	12.	13.	16.	20.	25.	31.	38.	46.
53.	61.	65.	83.	104.	134.	175.	237.	323.	435.
580.	767.	984.	1473.	2058.	2255.	2236.	2088.	1883.	1662.
1447.	1254.	1095.	1022.	953.	875.	755.	720.	647.	577.
517.	462.	412.	369.	336.	305.	277.	252.	229.	208.
192.	177.	164.	151.	140.	129.	118.	109.	100.	92.
84.	77.	71.	68.	64.	61.	58.	55.	52.	49.
46.	43.	41.	38.	36.	34.	32.	30.	28.	26.
24.	23.	21.	20.	19.	17.	16.	15.	14.	13.
12.	11.	10.	10.	9.	8.	8.	7.	7.	6.
6.	5.	5.	5.	4.	4.	4.	3.	3.	3.
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1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	0.	0.	0.	0.	0.	0.	0.	0.

STORAGE

130.	131.	131.	131.	131.	131.	131.	131.	131.	131.
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137.	136.	136.	136.	136.	136.	135.	135.	135.	135.
135.	135.	136.	136.	138.	139.	142.	145.	148.	151.
155.	159.	163.	167.	173.	180.	192.	207.	226.	249.
277.	311.	345.	383.	403.	405.	408.	404.	357.	390.
382.	374.	366.	356.	344.	330.	316.	303.	289.	277.
265.	254.	244.	236.	228.	222.	215.	210.	205.	200.
196.	192.	188.	185.	182.	179.	176.	174.	171.	169.
167.	165.	164.	162.	160.	159.	157.	156.	154.	153.
152.	150.	149.	148.	147.	146.	145.	144.	143.	142.
142.	141.	140.	139.	139.	138.	138.	137.	137.	136.
136.	136.	135.	135.	135.	134.	134.	134.	133.	133.
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131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	131.	131.	131.	131.	131.	131.	131.

STAGE

1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.1	1494.1	1494.1	1494.2	1494.2
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1494.2	1494.2	1494.2	1494.2	1494.2	1494.2	1494.2	1494.2	1494.1	1494.1
1494.1	1494.2	1494.2	1494.2	1494.2	1494.3	1494.3	1494.4	1494.5	1494.6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1496.2	1497.3

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1495.9	1495.8	1495.7	1495.6	1495.5	1495.4	1495.4	1495.3	1495.2	1495.1
1495.1	1495.0	1495.0	1494.9	1494.9	1494.8	1494.8	1494.8	1494.7	1494.7
1494.6	1494.6	1494.6	1494.5	1494.5	1494.5	1494.4	1494.4	1494.4	1494.4
1494.3	1494.3	1494.3	1494.3	1494.3	1494.2	1494.2	1494.2	1494.2	1494.2
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1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0

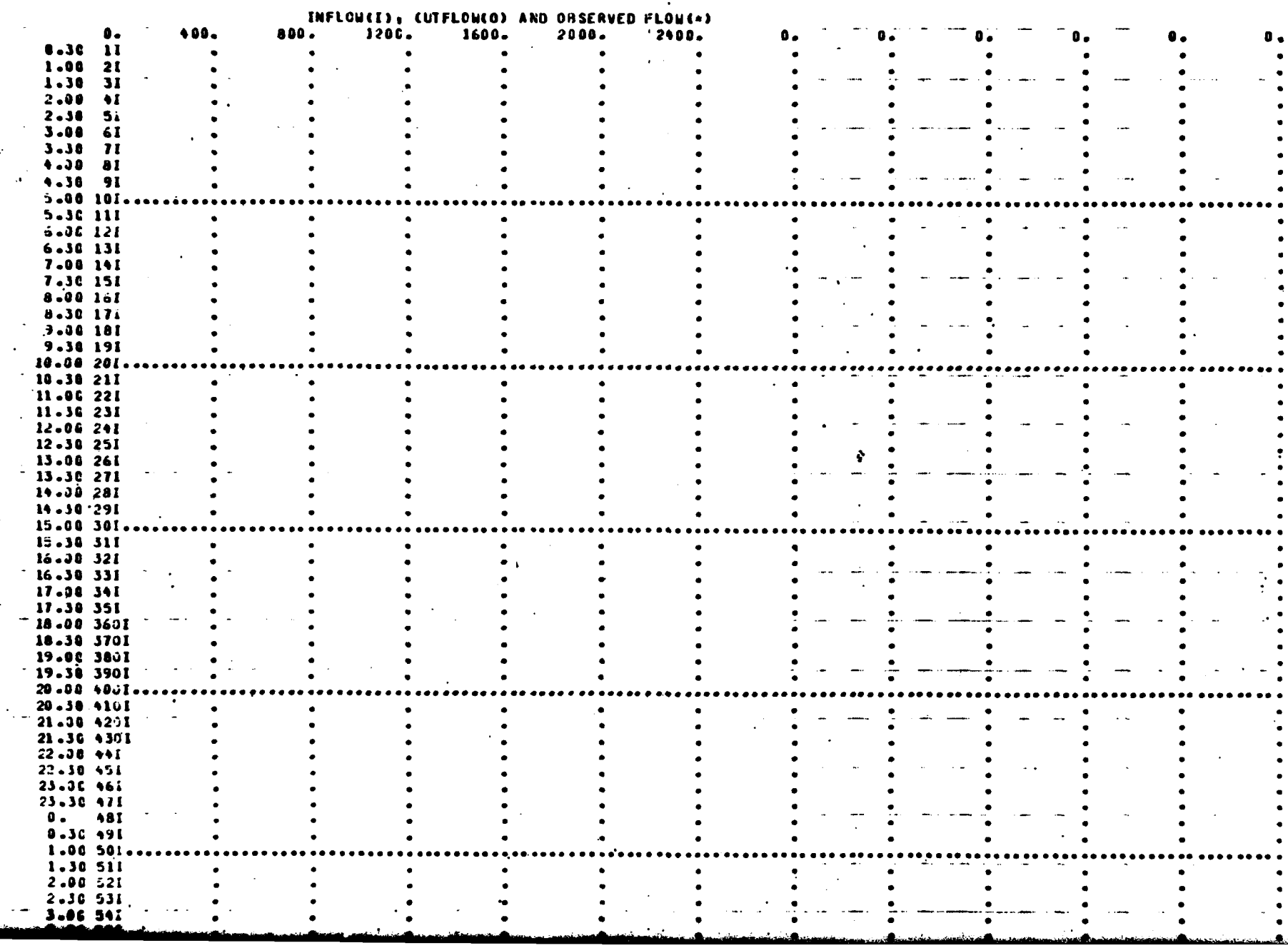
PEAK OUTFLOW IS 2259. AT TIME 43.00 HOURS

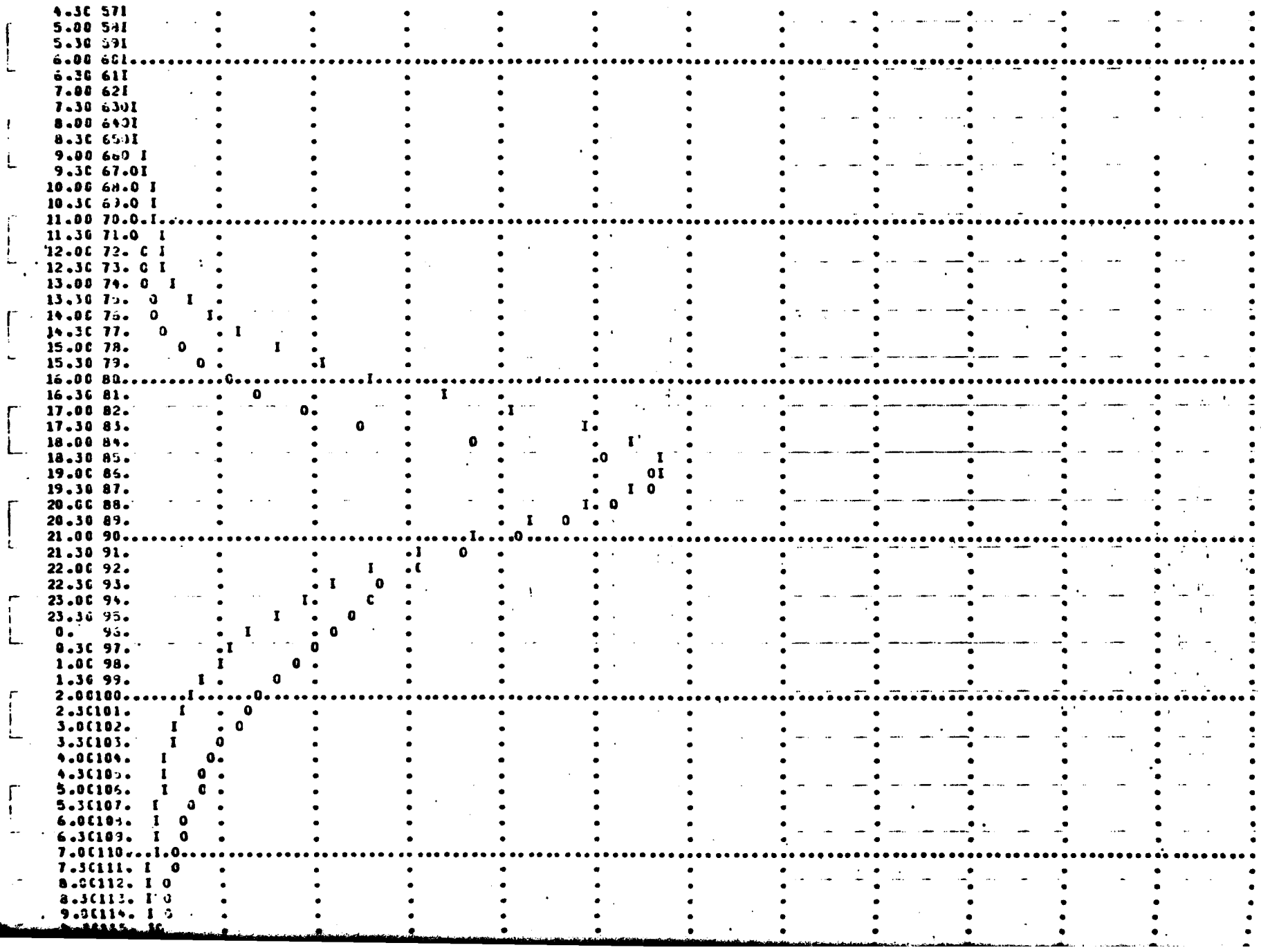
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2259.	1621.	660.	234.	33705.
CMS	64.	46.	19.	7.	954.
INCHES		4.94	8.05	8.56	8.57
MM		125.56	204.58	217.34	217.59
AC-FT		804.	1310.	1391.	1393.
THOUS CU M		951.	1615.	1716.	1718.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)





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 3.0019 8I
 3.3019 9I
 4.0020 0I
```

STATION 1, PLAN 1, RATIO 3

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	2.	3.	5.	8.	11.	14.	17.
19.	20.	21.	22.	22.	21.	21.	20.	19.	18.
17.	17.	16.	15.	15.	14.	14.	14.	13.	13.
13.	14.	14.	16.	20.	25.	31.	39.	48.	57.
66.	79.	96.	115.	140.	175.	230.	313.	422.	565.
755.	950.	1623.	2387.	2743.	2860.	2757.	2598.	2324.	2052.
1777.	1526.	1313.	1143.	1041.	977.	902.	822.	747.	673.
601.	539.	486.	437.	394.	358.	327.	299.	273.	249.
227.	207.	192.	178.	165.	153.	141.	130.	120.	111.
102.	94.	86.	79.	72.	65.	65.	62.	59.	56.
53.	50.	47.	44.	42.	39.	37.	35.	33.	31.
29.	27.	25.	23.	22.	20.	19.	18.	17.	15.
14.	13.	12.	12.	11.	10.	9.	9.	8.	7.
7.	6.	6.	6.	5.	5.	4.	4.	4.	3.
3.	3.	3.	3.	2.	2.	2.	2.	2.	2.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.

STORAGE

131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
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161.	166.	170.	175.	182.	191.	205.	223.	246.	274.
309.	350.	385.	412.	422.	425.	423.	418.	411.	403.
394.	385.	377.	368.	359.	348.	335.	321.	307.	294.
281.	269.	259.	249.	241.	233.	227.	220.	215.	209.
205.	200.	196.	192.	189.	185.	182.	179.	177.	174.
172.	170.	168.	166.	164.	162.	161.	159.	158.	156.
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131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	131.	131.	131.	131.	131.	131.	131.

STAGE

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1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
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1494.2	1494.2	1494.2	1494.2	1494.3	1494.3	1494.4	1494.5	1494.7	1494.8
1494.9	1495.1	1495.2	1495.3	1495.5	1495.8	1496.2	1496.6	1497.2	1497.9
1498.8	1499.7	1500.6	1501.1	1501.3	1501.4	1501.3	1501.2	1501.1	1500.9

1498.1	1497.8	1497.6	1497.3	1497.1	1496.9	1496.7	1496.6	1496.4	1496.3
1496.1	1496.0	1495.9	1495.8	1495.7	1495.6	1495.5	1495.4	1495.4	1495.3
1495.2	1495.2	1495.1	1495.1	1495.0	1495.0	1494.9	1494.9	1494.8	1494.8
1494.7	1494.7	1494.7	1494.6	1494.6	1494.5	1494.5	1494.5	1494.5	1494.4
1494.4	1494.4	1494.3	1494.3	1494.3	1494.3	1494.3	1494.2	1494.2	1494.2
1494.2	1494.2	1494.2	1494.2	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1
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1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0

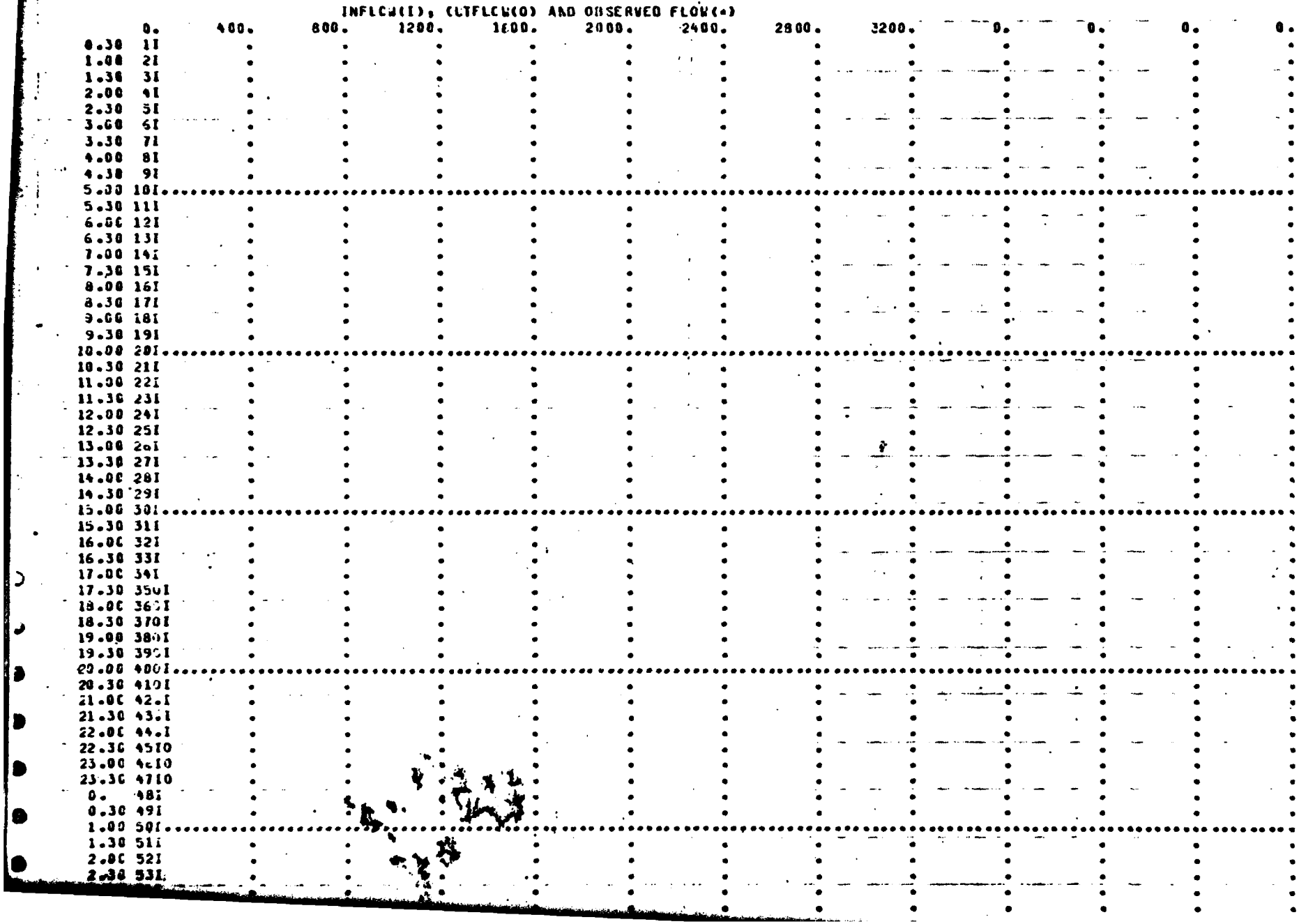
PEAK OUTFLOW IS 2860. AT TIME 43.00 HOURS

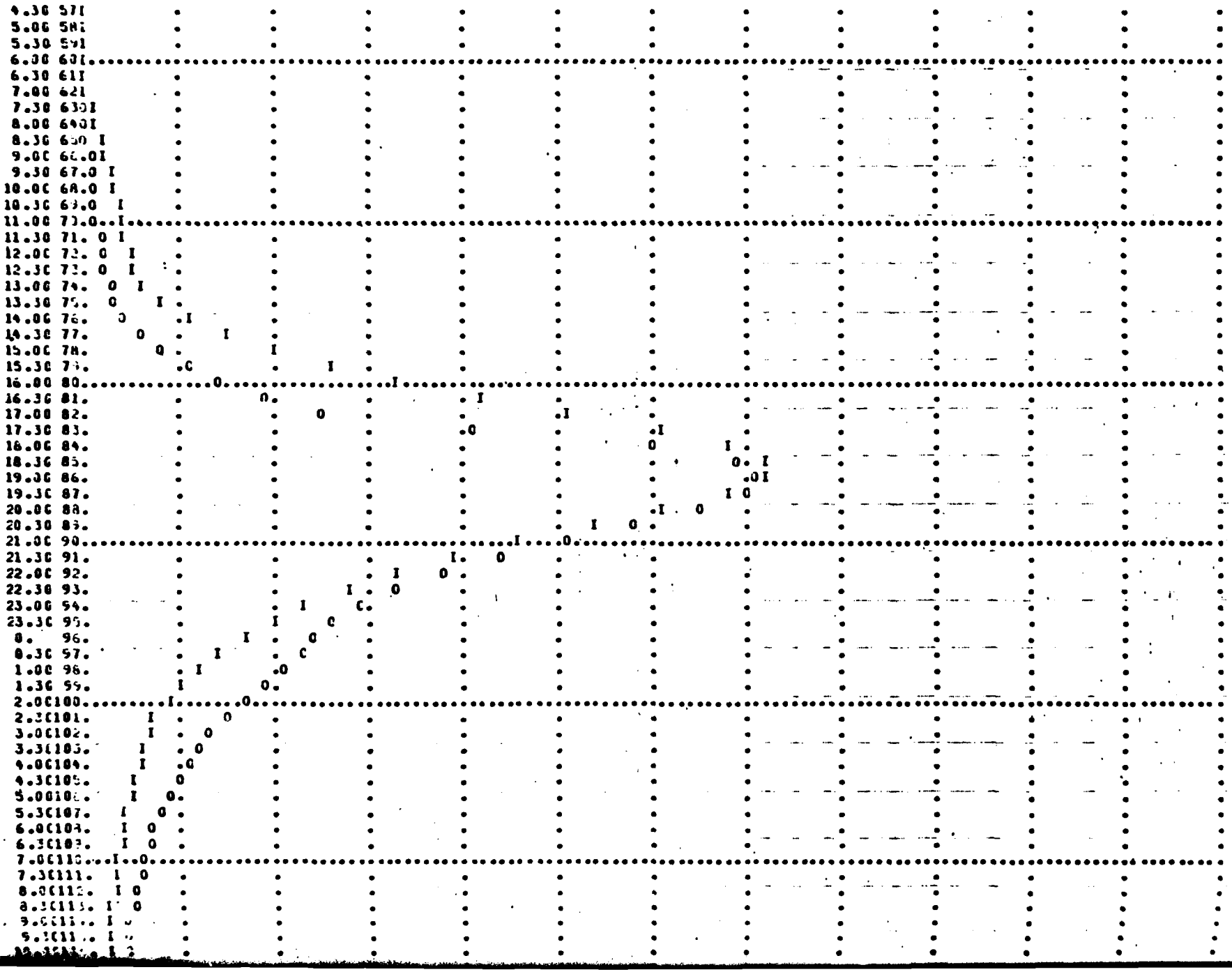
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2860.	2050.	827.	292.	42131.
CMS	81.	59.	23.	8.	1193.
INCHES		6.37	10.09	10.70	10.71
MM		161.89	256.35	271.68	271.99
AC-FT		1036.	1641.	1739.	1741.
THOUS CU M		1278.	2024.	2145.	2147.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)





11.0C118. I0
11.3C119.I 0
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12.3C121.I 0
13.0C122.IC
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14.0C124.IC
14.3C125.IC
15.0C126.IC
15.3C127.IC
16.0C128.IC
16.3C129.I
17.0C130.I
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18.0C132I0
18.3C133I0
19.0C134I0
19.3C135I0
20.0C136I0
20.3C137I0
21.0C138I0
21.3C139I0
22.0C140I0
22.3C141I0
23.0C142I0
23.3C143I0
0. 144I0
3.3C145I0
1.0C146I0
1.3C147I
2.0C148I
2.3C149I
3.0C150I
3.3C151I
4.0C152I
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8.3C161I
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12.0C168I
12.3C169I
13.0C170I
13.3C171I
14.0C172I
14.3C173I
15.0C174I
15.3C175I
16.0C176I

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17.3C179I
18.0C180I
18.3C181I
19.0C182I
19.3C183I
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20.3C185I
21.0C186I
21.3C187I
22.0C188I
22.3C189I
23.0C190I
23.3C191I
 0.  192I
 0.3C193I
 1.0C194I
 1.3C195I
 2.0C196I
 2.3C197I
 3.0C198I
 3.3C199I
 4.0C200I
```

DWN

STATION 1, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	2.	4.	6.	10.	14.	17.	20.
23.	24.	25.	26.	26.	25.	25.	24.	23.	22.
21.	20.	19.	18.	17.	17.	17.	16.	16.	16.
16.	16.	17.	20.	24.	30.	37.	47.	57.	68.
85.	105.	123.	145.	173.	216.	289.	386.	525.	702.
931.	1463.	2438.	3012.	3327.	3440.	3354.	3107.	2785.	2443.
2109.	1805.	1542.	1328.	1155.	1046.	984.	911.	831.	755.
681.	611.	551.	500.	453.	411.	373.	343.	315.	289.
264.	242.	221.	203.	189.	175.	163.	151.	139.	129.
119.	109.	101.	93.	85.	78.	72.	68.	65.	62.
59.	56.	53.	50.	47.	44.	42.	39.	37.	35.
32.	30.	28.	27.	25.	23.	22.	20.	19.	18.
17.	15.	14.	13.	12.	12.	11.	10.	9.	9.
8.	7.	7.	6.	6.	6.	5.	5.	4.	4.
4.	3.	3.	3.	3.	3.	2.	2.	2.	2.
2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	0.	0.	0.	0.

STORAGE

131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	131.	132.	133.	135.	137.	138.	140.
141.	142.	142.	142.	142.	142.	142.	141.	141.	140.
140.	139.	139.	139.	138.	138.	138.	138.	138.	138.
138.	138.	138.	139.	141.	144.	148.	152.	157.	162.
167.	173.	178.	183.	191.	202.	218.	239.	266.	299.
340.	383.	414.	428.	436.	435.	437.	431.	423.	414.
404.	395.	386.	377.	369.	360.	349.	336.	323.	309.
296.	283.	272.	261.	252.	244.	237.	230.	224.	218.
213.	208.	203.	199.	195.	192.	188.	185.	182.	179.
176.	174.	171.	169.	167.	166.	164.	162.	161.	159.
158.	156.	155.	153.	152.	151.	150.	148.	147.	146.
145.	144.	143.	143.	142.	141.	140.	140.	139.	138.
138.	137.	137.	136.	136.	136.	135.	135.	135.	134.
134.	134.	134.	133.	133.	133.	133.	133.	132.	132.
132.	132.	132.	132.	132.	132.	131.	131.	131.	131.
131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	131.	131.	131.	131.	131.	131.	131.

STAGE

1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.1	1494.1	1494.1	1494.2	1494.2	1494.2
1494.3	1494.3	1494.4	1494.4	1494.4	1494.4	1494.3	1494.3	1494.3	1494.3
1494.3	1494.3	1494.3	1494.3	1494.2	1494.2	1494.2	1494.2	1494.2	1494.2
1494.2	1494.2	1494.2	1494.3	1494.3	1494.4	1494.5	1494.6	1494.8	1494.5
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1497.1	1497.7	1498.6

1498.5	1498.2	1497.9	1497.6	1497.4	1497.2	1497.0	1496.8	1496.7	1496.5
1496.4	1496.2	1496.1	1496.0	1495.9	1495.8	1495.7	1495.6	1495.5	1495.4
1495.4	1495.3	1495.2	1495.2	1495.1	1495.0	1495.0	1495.0	1494.9	1494.9
1494.8	1494.8	1494.7	1494.7	1494.7	1494.6	1494.6	1494.5	1494.5	1494.5
1494.5	1494.4	1494.4	1494.4	1494.3	1494.3	1494.3	1494.3	1494.3	1494.2
1494.2	1494.2	1494.2	1494.2	1494.2	1494.2	1494.1	1494.1	1494.1	1494.1
1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1
1494.1	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0

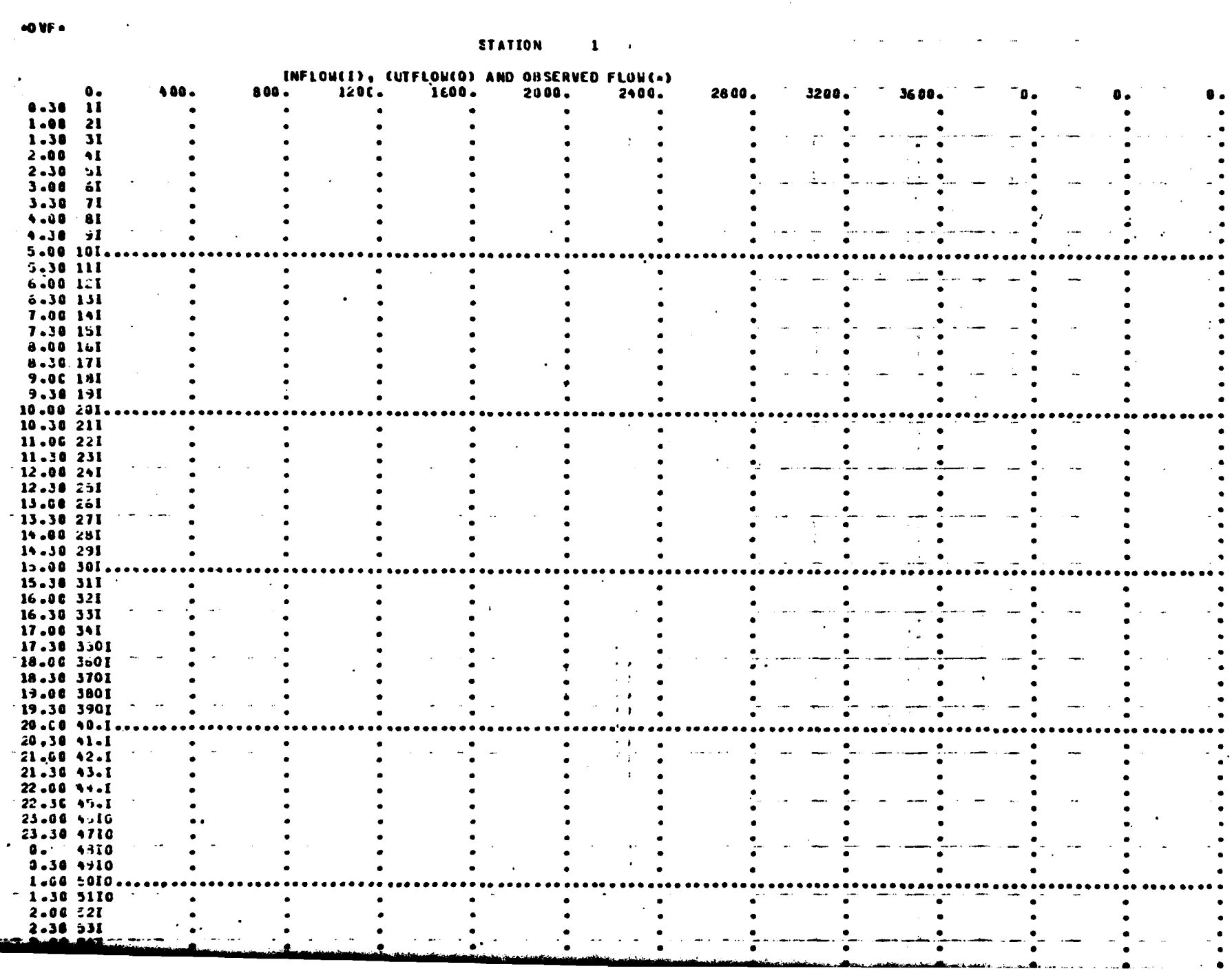
PEAK OUTFLOW IS 3440. AT TIME 43.00 HOURS

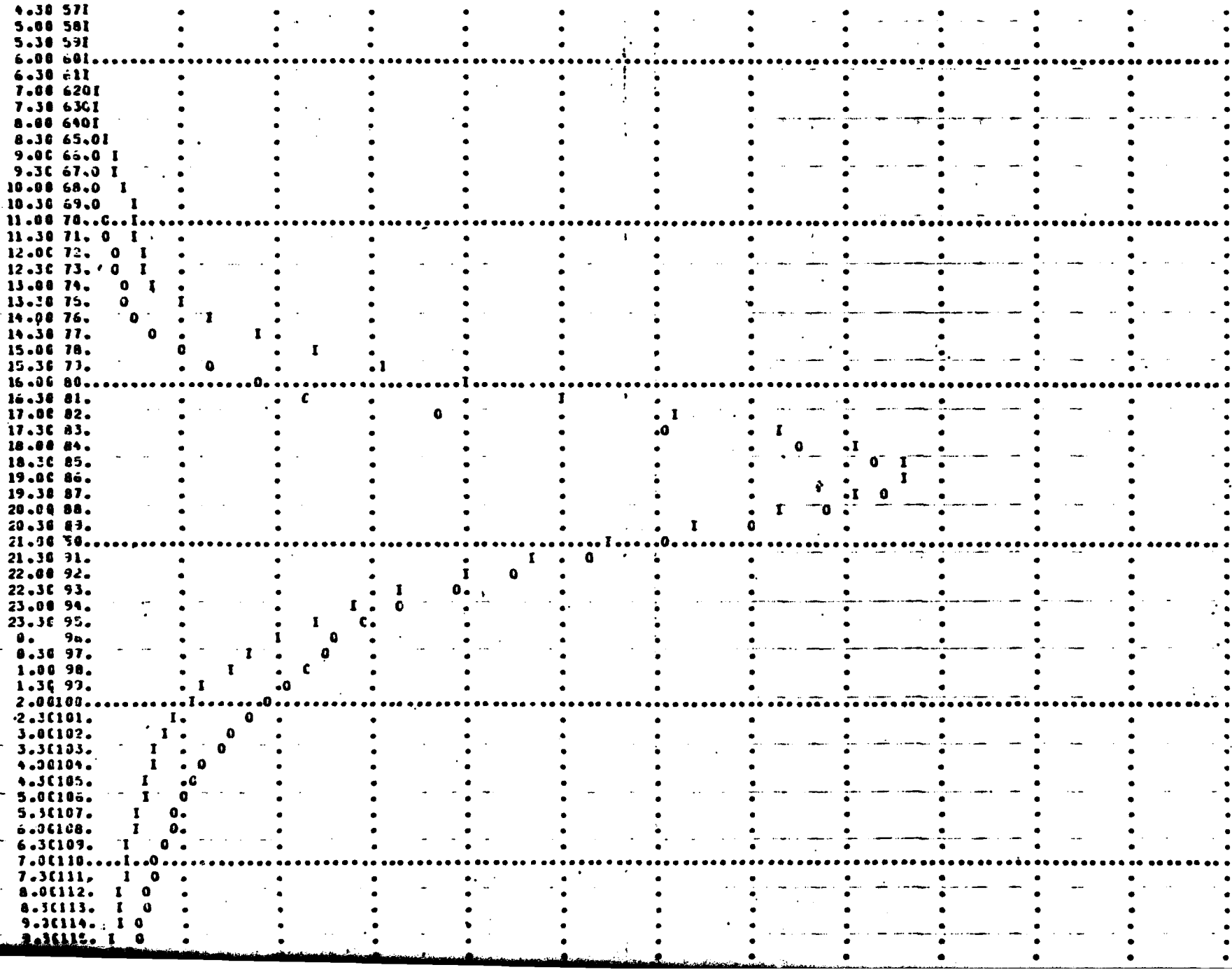
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3440.	2563.	994.	351.	50557.
CMS	97.	73.	28.	10.	1432.
INCHES		7.82	12.13	12.94	12.85
MM		198.57	308.09	326.02	326.38
AC-FT		1271.	1972.	2087.	2089.
THOUS CU M		1568.	2433.	2574.	2577.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)





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13.00122.I 0
13.30123.I 0
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14.30125.I0
15.00126.I0
15.30127.I0
16.00128.I0
16.30129.I0
17.00130.I0
17.30131.I
18.00132.I
18.30133I0
19.30134I0
19.30135I0
20.00136I0
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22.00140I0
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22.0C188I
22.3C189I
23.0C190I
23.3C191I
 0.  192I
 0.3C193I
 1.0C194I
 1.3C195I
 2.0C196I
 2.3C197I
 3.0C198I
 3.3C199I
 4.00200I
```

0 VN

STATION 1, PLAN 1, RATIO 5

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	1.	1.	1.	1.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	3.	5.	9.	13.	18.	23.	27.
30.	33.	34.	34.	34.	34.	33.	32.	31.	29.
28.	26.	25.	24.	23.	23.	22.	22.	21.	21.
21.	22.	23.	26.	32.	40.	50.	62.	79.	104.
128.	152.	175.	201.	245.	310.	405.	545.	733.	975.
1656.	2773.	3522.	4087.	4463.	4597.	4466.	4123.	3686.	3225.
2776.	2365.	2013.	1719.	1475.	1275.	1119.	1033.	968.	893.
812.	739.	672.	611.	557.	511.	468.	428.	391.	359.
332.	306.	282.	259.	238.	218.	201.	187.	174.	162.
150.	139.	128.	119.	109.	101.	93.	85.	78.	72.
69.	65.	62.	59.	56.	53.	50.	47.	44.	42.
39.	37.	35.	33.	31.	29.	27.	25.	23.	22.
21.	19.	18.	17.	16.	14.	13.	13.	12.	11.
10.	9.	9.	8.	7.	7.	6.	6.	6.	5.
5.	4.	4.	4.	4.	3.	3.	3.	3.	2.
2.	2.	2.	2.	2.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	0.

STORAGE

131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	132.	133.	134.	136.	139.	141.	143.
144.	145.	146.	146.	146.	146.	146.	145.	144.	144.
143.	142.	142.	141.	141.	141.	141.	140.	140.	140.
140.	140.	141.	142.	145.	149.	153.	159.	166.	172.
179.	185.	191.	199.	208.	223.	243.	270.	305.	348.
391.	422.	441.	453.	461.	464.	462.	454.	444.	434.
422.	412.	401.	392.	383.	375.	367.	358.	346.	333.
320.	306.	294.	283.	273.	264.	255.	247.	240.	234.
227.	222.	216.	211.	207.	202.	199.	195.	191.	188.
185.	182.	179.	176.	174.	172.	169.	167.	166.	164.
162.	161.	159.	158.	156.	155.	153.	152.	151.	150.
149.	147.	146.	145.	144.	144.	143.	142.	141.	140.
140.	139.	139.	138.	137.	137.	137.	136.	136.	135.
135.	135.	134.	134.	134.	134.	133.	133.	133.	133.
133.	132.	132.	132.	132.	132.	132.	132.	132.	131.
131.	131.	131.	131.	131.	131.	131.	131.	131.	131.
131.	131.	131.	131.	131.	131.	131.	131.	131.	131.

STAGE

1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.1	1494.1	1494.2	1494.3	1494.3	1494.4
1494.4	1494.5	1494.5	1494.5	1494.5	1494.5	1494.5	1494.4	1494.4	1494.4
1494.4	1494.4	1494.4	1494.3	1494.3	1494.3	1494.3	1494.3	1494.3	1494.3
1494.3	1494.3	1494.3	1494.4	1494.4	1494.5	1494.7	1494.9	1495.1	1495.2
1495.4	1495.6	1495.8	1496.0	1496.2	1496.6	1497.2	1497.8	1498.7	1499.7
1500.6	1501.3	1501.7	1502.0	1502.1	1502.2	1502.1	1502.0	1501.8	1501.6

1499.0	1498.7	1498.4	1498.2	1497.9	1497.7	1497.5	1497.3	1497.1	1496.9
1496.8	1496.6	1496.5	1496.3	1496.2	1496.1	1496.0	1495.9	1495.8	1495.7
1495.6	1495.5	1495.4	1495.4	1495.3	1495.2	1495.2	1495.1	1495.0	1495.0
1495.0	1494.9	1494.9	1494.8	1494.8	1494.7	1494.7	1494.7	1494.6	1494.6
1494.5	1494.5	1494.5	1494.5	1494.4	1494.4	1494.4	1494.3	1494.3	1494.3
1494.3	1494.3	1494.2	1494.2	1494.2	1494.2	1494.2	1494.2	1494.2	1494.2
1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1	1494.1
1494.1	1494.1	1494.1	1494.1	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0
1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0	1494.0

PEAK OUTFLOW IS 4597. AT TIME 43.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4597.	3495.	1328.	468.	67409.
CMS	130.	99.	38.	13.	1909.
INCHES		10.66	16.21	17.11	17.13
MM		270.73	411.61	434.70	435.17
AC-FT		1733.	2635.	2782.	2786.
THOUS CU M		2138.	3250.	3432.	3436.

```
*OWF*
                                        STATION      1

                        INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
        0.     1000.     2000.     3000.     4000.     5000.        0.        0.        0.        0.        0.        0.        0.
 0.30  1I        .         .         .         .         .         .         .         .         .         .         .         .
 1.00  2I        .         .         .         .         .         .         .         .         .         .         .         .
 1.30  3I        .         .         .         .         .         .         .         .         .         .         .         .
 2.00  4I        .         .         .         .         .         .         .         .         .         .         .         .
 2.30  5I        .         .         .         .         .         .         .         .         .         .         .         .
 3.00  6I        .         .         .         .         .         .         .         .         .         .         .         .
 3.30  7I        .         .         .         .         .         .         .         .         .         .         .         .
 4.00  8I        .         .         .         .         .         .         .         .         .         .         .         .
 4.30  9I        .         .         .         .         .         .         .         .         .         .         .         .
 5.00 10I.........................................................................................................................
 5.30 11I        .         .         .         .         .         .         .         .         .         .         .         .
 6.00 12I        .         .         .         .         .         .         .         .         .         .         .         .
 6.30 13I        .         .         .         .         .         .         .         .         .         .         .         .
 7.00 14I        .         .         .         .         .         .         .         .         .         .         .         .
 7.30 15I        .         .         .         .         .         .         .         .         .         .         .         .
 8.00 16I        .         .         .         .         .         .         .         .         .         .         .         .
 8.30 17I        .         .         .         .         .         .         .         .         .         .         .         .
 9.00 18I        .         .         .         .         .         .         .         .         .         .         .         .
 9.30 19I        .         .         .         .         .         .         .         .         .         .         .         .
10.00 20I.........................................................................................................................
10.30 21I        .         .         .         .         .         .         .         .         .         .         .         .
11.00 22I        .         .         .         .         .         .         .         .         .         .         .         .
11.30 23I        .         .         .         .         .         .         .         .         .         .         .         .
12.00 24I        .         .         .         .         .         .         .         .         .         .         .         .
12.30 25I        .         .         .         .         .         .         .         .         .         .         .         .
13.00 26I        .         .         .         .         .         .         .         .         .         .         .         .
13.30 27I        .         .         .         .         .         .         .         .         .         .         .         .
14.00 28I        .         .         .         .         .         .         .         .         .         .         .         .
14.30 29I        .         .         .         .         .         .         .         .         .         .         .         .
15.00 30I.........................................................................................................................
15.30 31I        .         .         .         .         .         .         .         .         .         .         .         .
16.00 32I        .         .         .         .         .         .         .         .         .         .         .         .
16.30 33I        .         .         .         .         .         .         .         .         .         .         .         .
17.00 34I        .         .         .         .         .         .         .         .         .         .         .         .
17.30 35I        .         .         .         .         .         .         .         .         .         .         .         .
18.00 36OI       .         .         .         .         .         .         .         .         .         .         .         .
18.30 37OI       .         .         .         .         .         .         .         .         .         .         .         .
19.00 38OI       .         .         .         .         .         .         .         .         .         .         .         .
19.30 39OI       .         .         .         .         .         .         .         .         .         .         .         .
20.00 40OI........................................................................................................................
20.30 41OI       .         .         .         .         .         .         .         .         .         .         .         .
21.00 42OI       .         .         .         .         .         .         .         .         .         .         .         .
21.30 43I        .         .         .         .         .         .         .         .         .         .         .         .
22.00 44I        .         .         .         .         .         .         .         .         .         .         .         .
22.30 45I        .         .         .         .         .         .         .         .         .         .         .         .
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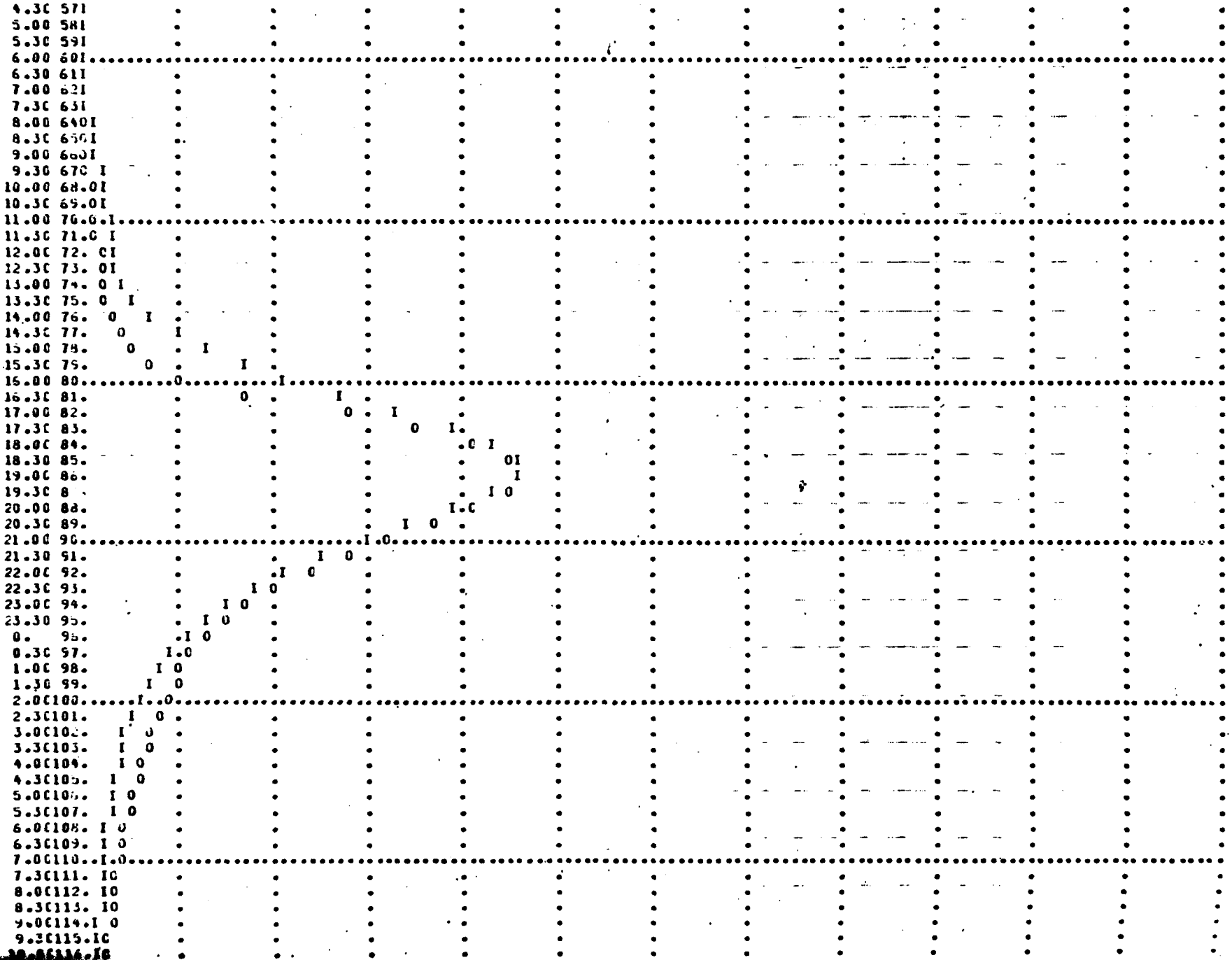

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40 UN.

STATION 1, PLAN 1, RATIO 6

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

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2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
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38.	41.	42.	43.	43.	42.	41.	40.	38.	36.
35.	33.	32.	30.	29.	28.	28.	27.	27.	27.
27.	27.	29.	33.	40.	49.	62.	81.	111.	140.
169.	156.	229.	268.	320.	400.	526.	706.	945.	1583.
2744.	3657.	4459.	5139.	5597.	5752.	5576.	5138.	4585.	4006.
3441.	2927.	2486.	2117.	1809.	1553.	1342.	1172.	1054.	954.
921.	845.	775.	713.	655.	600.	552.	509.	468.	430.
394.	363.	336.	311.	287.	264.	243.	224.	205.	191.
178.	166.	154.	143.	132.	122.	113.	104.	96.	88.
81.	74.	70.	67.	63.	60.	57.	54.	51.	48.
46.	43.	40.	38.	36.	34.	31.	29.	28.	26.
24.	23.	21.	20.	18.	17.	16.	15.	14.	13.
12.	11.	10.	10.	9.	8.	8.	7.	7.	6.
6.	5.	5.	5.	4.	4.	4.	3.	3.	3.
3.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

STORAGE

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146.	146.	145.	144.	144.	143.	143.	143.	143.	143.
143.	143.	144.	145.	149.	153.	159.	166.	174.	182.
190.	197.	205.	213.	225.	242.	267.	300.	342.	387.
422.	444.	461.	475.	485.	488.	484.	475.	464.	452.
439.	426.	415.	404.	395.	386.	378.	370.	361.	351.
338.	325.	313.	301.	291.	281.	272.	263.	255.	248.
241.	235.	229.	223.	218.	213.	208.	204.	200.	196.
192.	189.	186.	183.	180.	177.	175.	172.	170.	168.
166.	165.	163.	161.	160.	158.	157.	155.	154.	153.
151.	150.	149.	148.	147.	146.	145.	144.	143.	142.
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STAGE

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1495.7	1495.9	1496.1	1496.4	1496.7	1497.1	1497.8	1498.6	1499.6	1500.6

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1497.1	1496.9	1496.8	1496.6	1496.5	1496.4	1496.2	1496.1	1496.0	1495.9
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1494.6	1494.6	1494.6	1494.5	1494.5	1494.5	1494.4	1494.4	1494.4	1494.4
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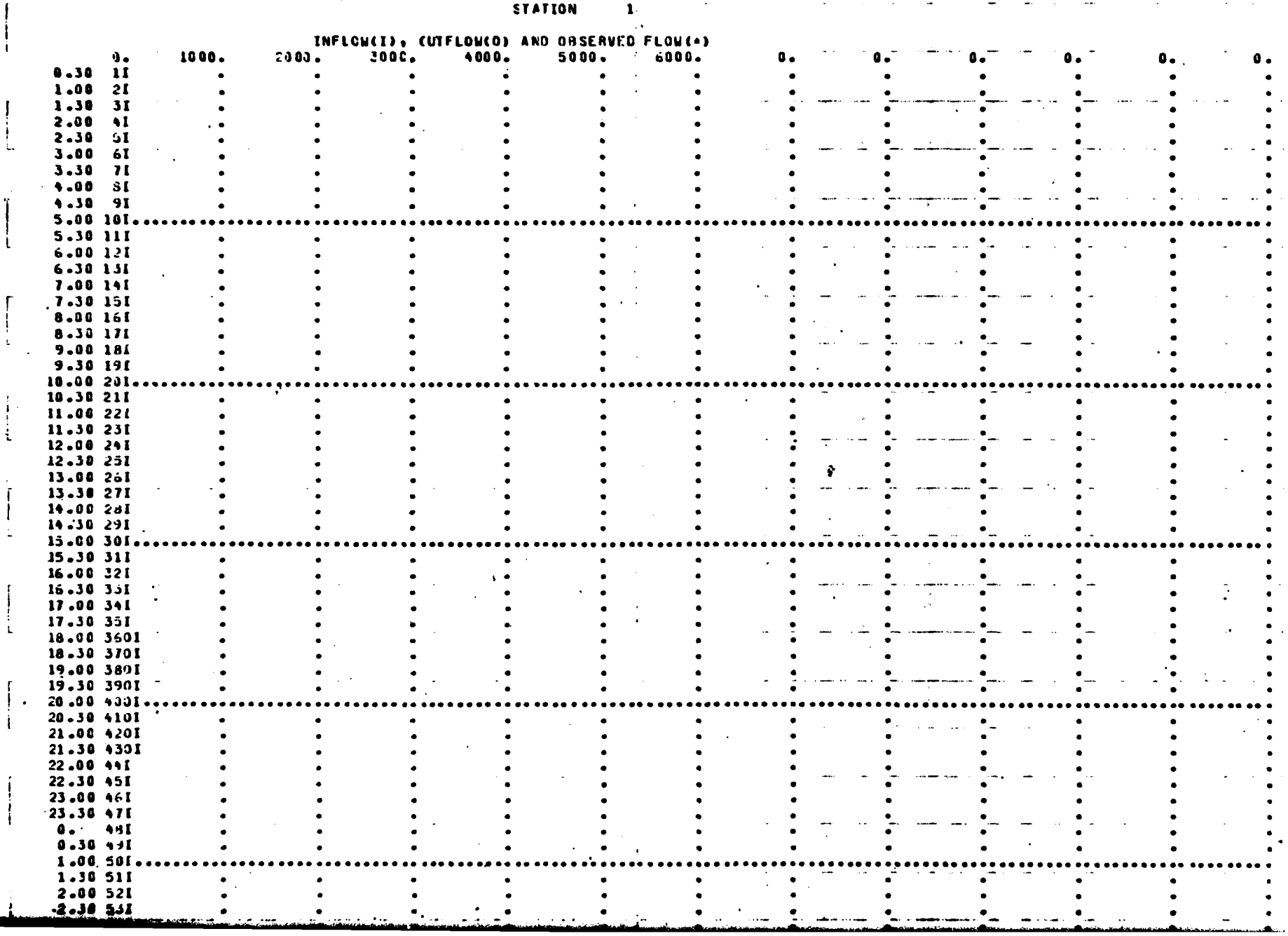
PEAK OUTFLOW IS 5752. AT TIME 43.00 HOURS

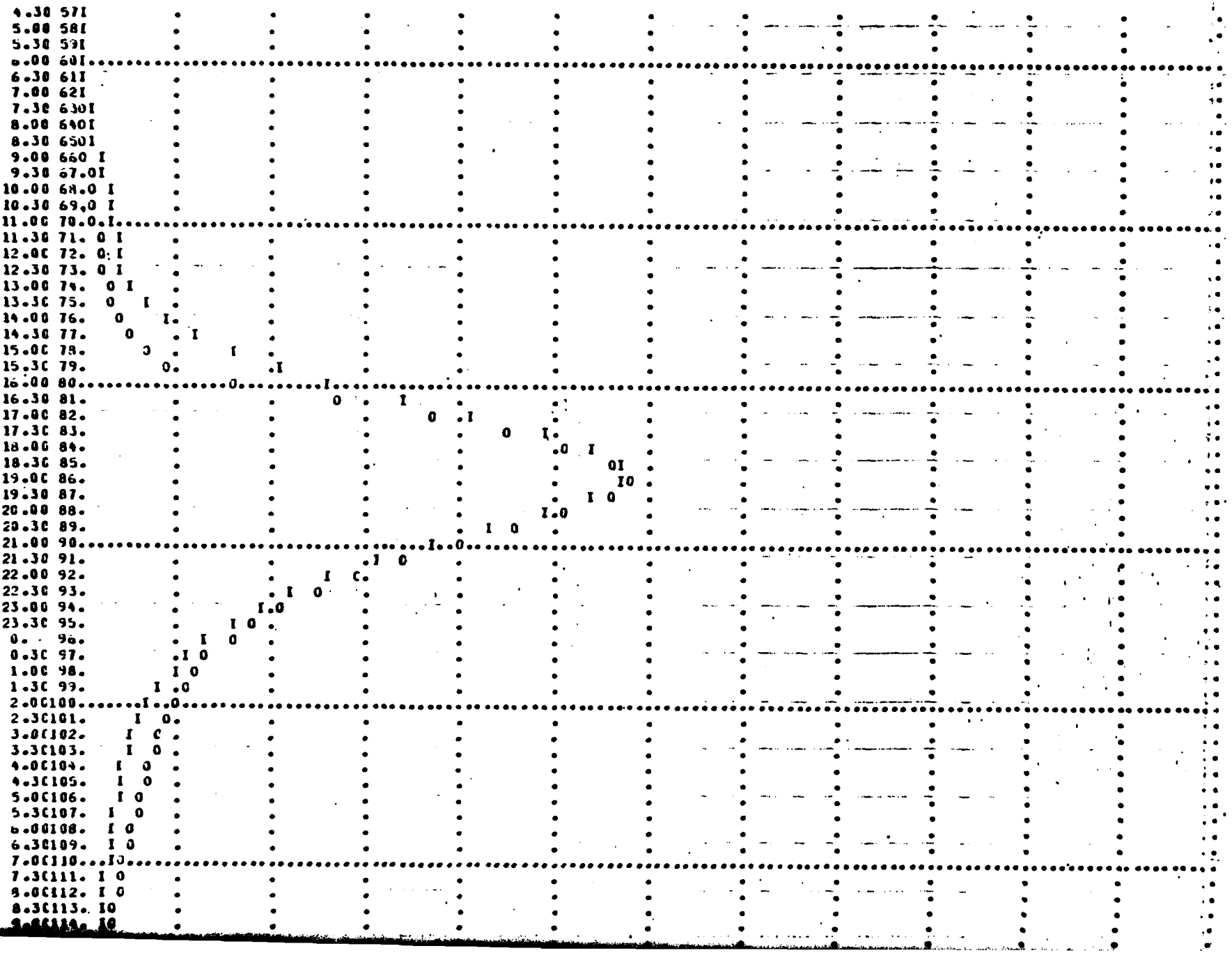
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5752.	4408.	1663.	585.	84262.
CMS	163.	125.	47.	17.	2386.
INCHES		13.44	20.29	21.39	21.42
MM		341.46	515.26	543.38	543.97
AC-FT		2186.	3259.	3478.	3482.
THOUS CU M		2696.	4068.	4290.	4295.

OVF

STATION 1

INFLOW(I), (OUTFLOW(O) AND OBSERVED FLOW(*)





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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FORMULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

				RATIOS APPLIED TO FLOWS					
OPERATION	STATION	AREA	PLAN	RATIO 1 0.20	RATIO 2 0.40	RATIO 3 0.50	RATIO 4 0.60	RATIO 5 0.80	RATIO 6 1.00
HYDROGRAPH AT	1	3.05 (14896.77)	1	1150. (32.56)(	2299. 65.11)(	2874. 81.39)(	3449. 97.67)(	4599. 130.22)(	5748. 162.78)(
ROUTED TO	1	3.05 (14896.77)	1	886. (25.09)(	2259. 63.96)(	2860. 80.98)(	3440. 97.42)(	4597. 130.16)(	5752. 162.87)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1494.00	1494.00	1500.00
STORAGE	130.	130.	362.
OUTFLOW	0.	0.	1058.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.20	1495.32	0.	332.	886.	0.	44.50	0.
0.40	1501.02	1.02	409.	2259.	5.00	43.00	0.
0.50	1501.36	1.36	425.	2860.	6.00	43.00	0.
0.60	1501.66	1.66	439.	3440.	7.00	43.00	0.
0.80	1502.20	2.20	464.	4597.	8.50	43.00	0.
1.00	1502.68	2.68	488.	5752.	9.50	43.00	0.

DCU47

-- 3 C -- DATE 07-27-81 TIME 11.988 ID = AJ NYSOGS

APPENDIX D

REFERENCES

APPENDIX D

REFERENCES

1) U.S. Department of Commerce, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, May 1961.

2) U.S. Department of Commerce, Hydrometeorological Report No. 33, Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Durations of 6, 12, 24, and 48 Hours; April 1956.

3) Soil Conservation Service, National Engineering Handbook, Section 4, Hydrology, August 1972 (U.S. Department of Agriculture).

4) H.W. King and E.F. Brater, Handbook of Hydraulics, 5th edition, McGraw-Hill, 1963.

5) T.W. Lambe and R.V. Whitman, Soil Mechanics, John Wiley and Sons, 1965.

6) W.D. Thornbury, Principles of Geomorphology, John Wiley and Sons, 1969.

7) University of the State of New York, Geology of New York, Education Leaflet 20, Reprinted 1973.

8) Cornell University Agriculture Experiment Station (compiled by M.G. Cline and R.L. Marshall), General Soil Map of New York State and Soils of New York Landscapes, Information Bulletin 119, 1977.

AD-A109 897 NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/G 13/13
NATIONAL DAM SAFETY PROGRAM. WILLIAM H. LUEHMANN RECREATION PON--ETC(U)
SEP 81 G KOCH DACW51-79-C-0001

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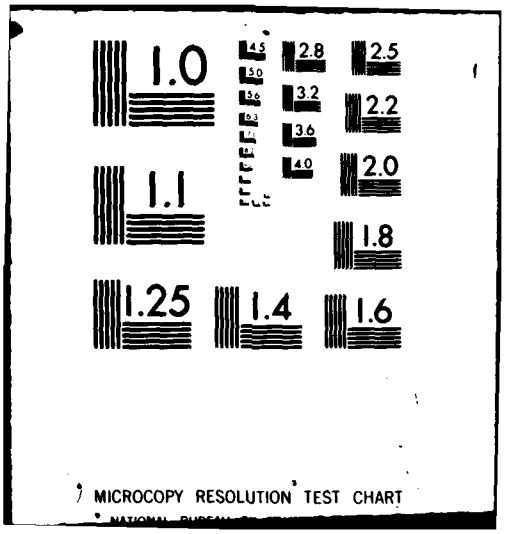
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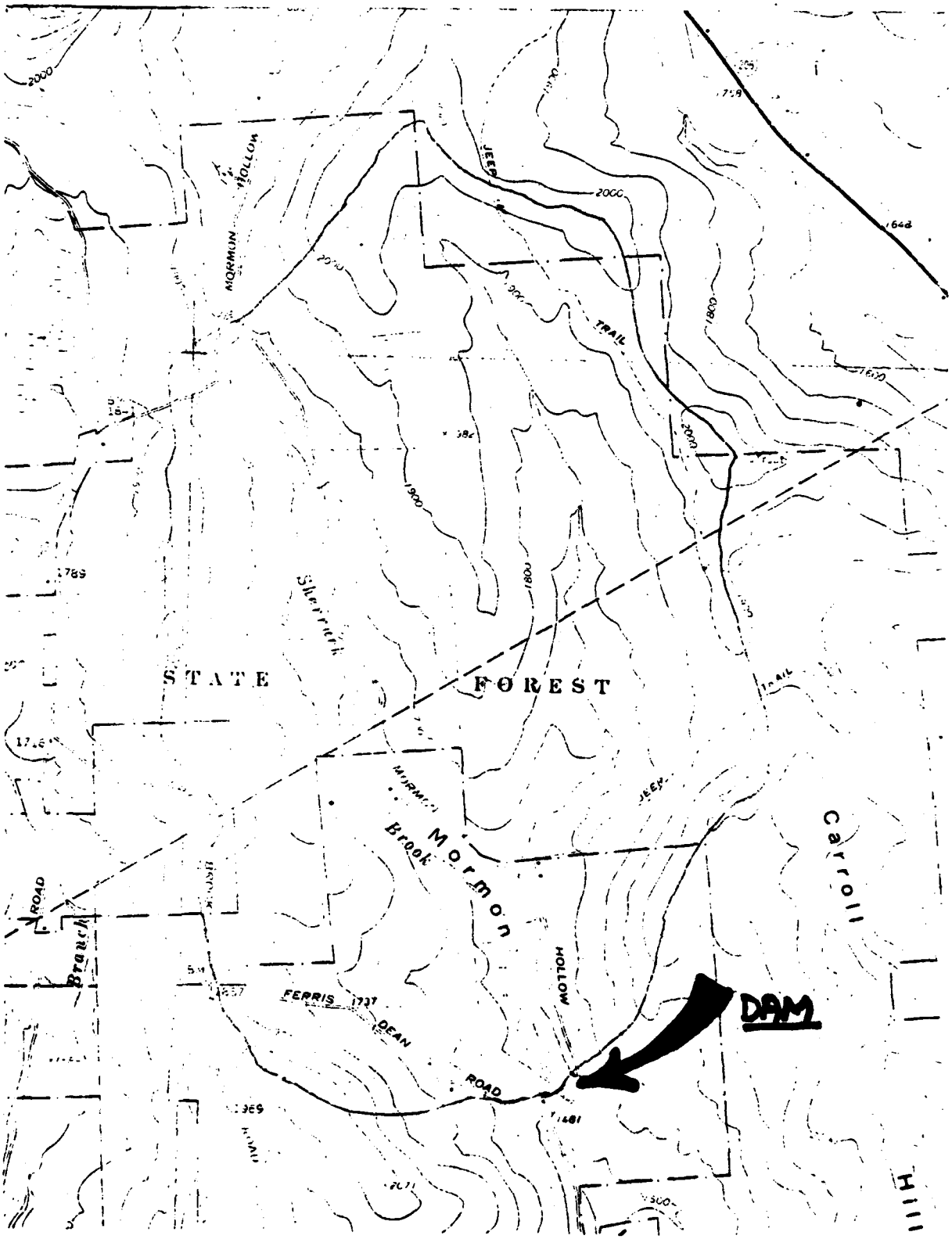
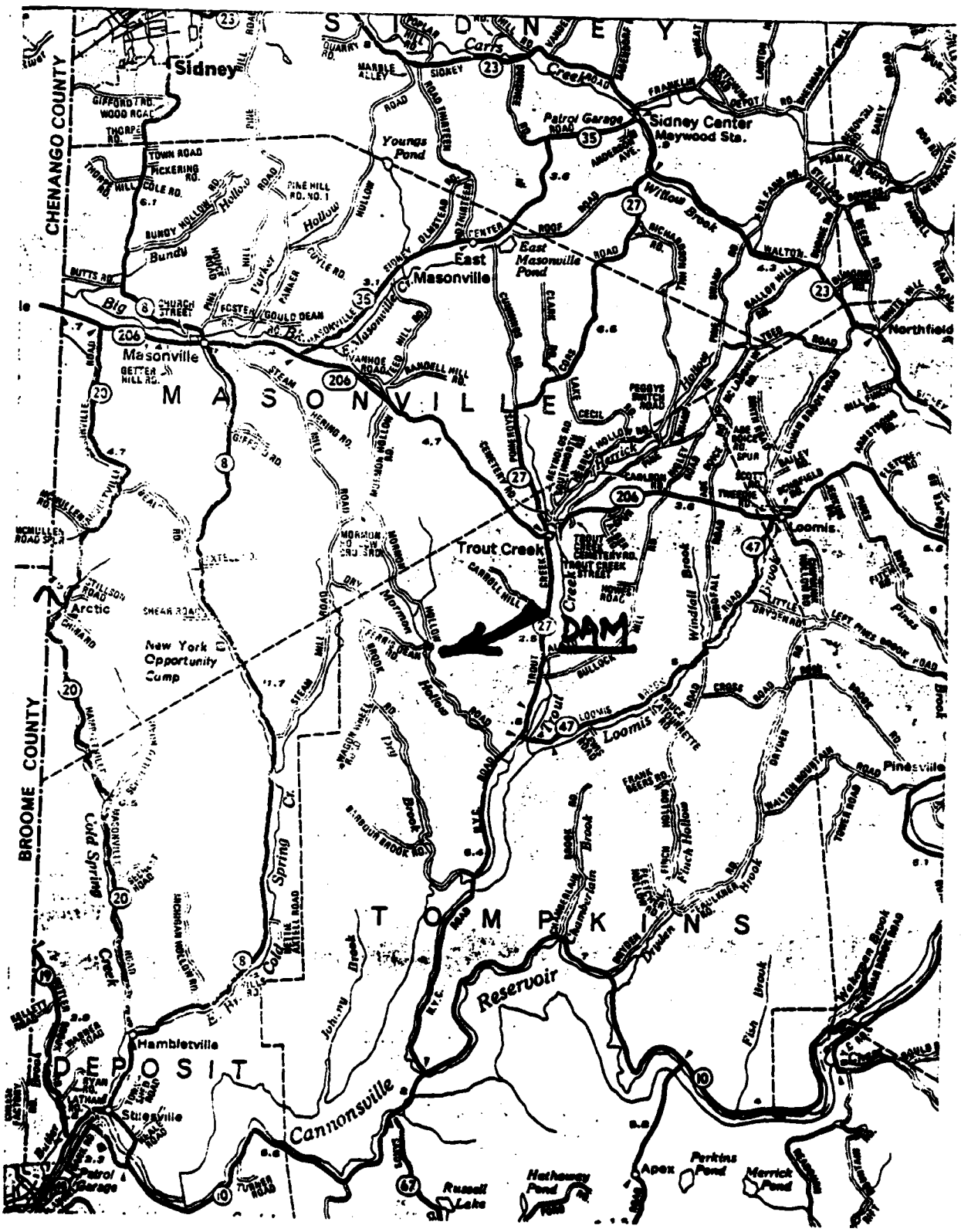
MICROCOPY RESOLUTION TEST CHART

APPENDIX E

DRAWINGS



TOPOGRAPHIC MAP



VICINITY MAP